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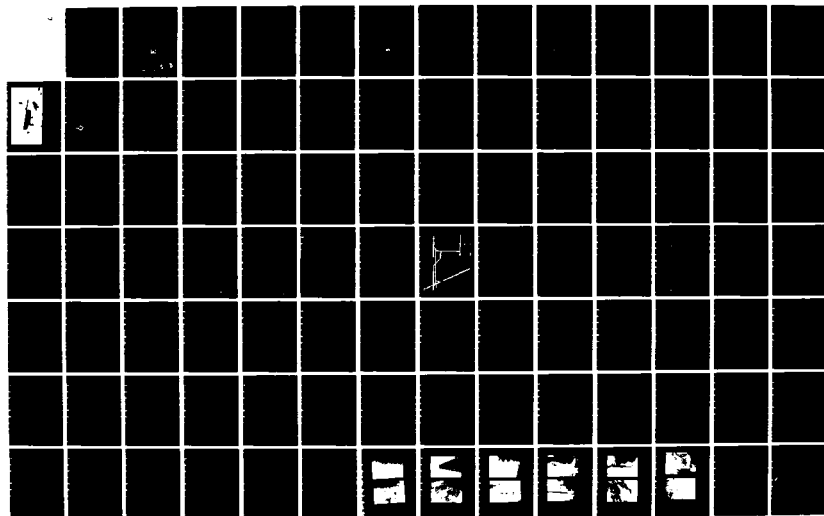
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
GRUPES RESERVOIR DAM (U) CORPS OF ENGINEERS WALTHAM
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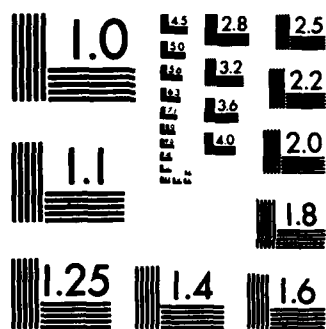
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AD-A142 686

CONNECTICUT COASTAL BASIN

NEW CANAAN, CONNECTICUT

**GRUPES RESERVOIR DAM
CT 00057**

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

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DECEMBER, 1979

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00057	2. GOVT ACCESSION NO AD-A142 686	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Conn. Coastal Basin New Canaan, Conn., Grupes Reservoir Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE December 1979
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Conn. Coastal Basin New Canaan, Conn. Grupes Reservoir Dam		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam, built in 1871, is a 225 ft. long stone and mortar masonry gravity dam used for water supply. The top is 5.7 ft. wide with a 7 ft. wide coping. The top of the coping is at elevation 298.9, which is 27+ ft. above the streambed of the Silvermine River. There are two spillways; a main spillway section at the left end of the dam and an auxiliary spillway approx. 40 ft. upstream from the right end of the dam. The main spillway is a 48.9 ft. long broad-crested weir spanned by an access bridge which allows 6+ ft. of clearance between the spillway crest and the low chord of the bridge. The auxiliary spillway is approx. 60 ft. long at the crest and is an unlined channel cut around the right side of the dam.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED-E

JUL 25 1980

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

Inclosed is a copy of the Grupes Reservoir Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Grupes Reservoir Dam would likely be exceeded by floods greater than 18 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

NEDED-E

Honorable Ella T. Grasso

I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. This report has also been furnished to the owner of the project, Mr. Richard Kelly, First District Water Department, 3 Belden Avenue, Norwalk, Connecticut.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for the cooperation extended in carrying out this program.

Sincerely,

Max B. Scheider

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

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CONNECTICUT COASTAL BASIN

NEW CANAAN, CONNECTICUT

**GRUPES RESERVOIR DAM
CT 00057**

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**



**DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154**

DECEMBER, 1979

BRIEF ASSESSMENT

PHASE I INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

Name of Dam:	GRUPES RESERVOIR DAM
Inventory Number:	CT 00057
State Located:	CONNECTICUT
County Located:	FAIRFIELD
Town Located:	NEW CANAAN
Stream:	SILVERMINE RIVER
Owner:	NORWALK WATER DEPARTMENT, FIRST DISTRICT
Date of Inspection:	NOVEMBER 5, 1979
Inspection Team:	PETER M. HEYNEN, P.E. MIRON PETROVSKY HECTOR MORENO, P.E. JAY COSTELLO

The dam, built in 1871, is a 225 foot long stone and mortar masonry gravity dam used for water supply. The top is 5.7 feet wide with a 7 foot wide coping. The top of the coping is at elevation 298.9, which is 27+ feet above the streambed of the Silvermine River. There are two spillways; a main spillway section at the left end of the dam and an auxiliary spillway approximately 40 feet upstream from the right end of the dam (See Sheet B-1). The main spillway is a 48.9 foot long broad-crested weir spanned by an access bridge which allows 6+ feet of clearance between the spillway crest and the low chord of the bridge. The auxiliary spillway is approximately 60 feet long at the crest and is an unlined channel cut around the right side of the dam. The two outlets are 24 inch and 16 inch cast iron pipes. The 24 inch pipe is located at the left end of the dam and serves as a low-level outlet or a supply line. The 16 inch pipe is located at the right end of the dam and is used as an emergency supply line.

Based upon the visual inspection at the site and past performance, the dam is judged to be in fair condition. The masonry of the dam and training walls appears to be in fair condition. There are areas requiring maintenance and monitoring such as cracks in the mortar joints of the masonry in the dam and spillway walls and seepage at the right end and central portion of the dam.

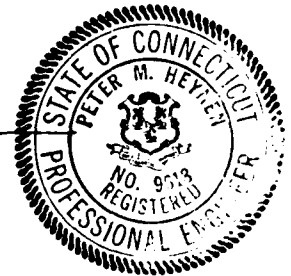
In accordance with Corps of Engineers Guidelines for size (Small) and hazard (high) classification for the dam, the range of test floods to be considered is one-half the Probable Maximum Flood ($\frac{1}{2}$ PMF) to the Probable Maximum Flood (PMF). At the PMF (test flood elevation 301.0), peak inflow to the reservoir is 16,300 cubic feet per second (cfs) and the peak outflow is 16,000 cfs with the dam overtopped 2.1 feet and flow over a low area in the service road. The spillway capacity with the reservoir level to the top of the dam is 2900 cfs, which is equivalent to 18% of the PMF outflow. The spillway capacity does not include flow over the low area in the service road.


It is recommended that the owner retain the services of a registered professional engineer to perform a more detailed hydraulic/hydrologic analysis to assess the overflow section at the service road as an auxiliary spillway. Other recommendations are to repair seepage through the masonry at the right end of the dam and through the upstream valve chambers, repair masonry walls at the spillway discharge channel and to check the outlet pipes for possible seepage.

The above recommendations and further remedial measures which are discussed in Section 7, should be instituted within one (1) year of the owner's receipt of this report.

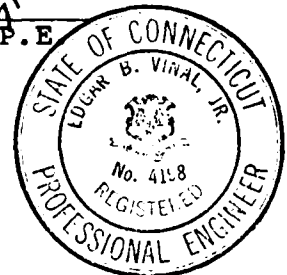


Peter M. Heynen, P.E.
Project Manager
Cahn Engineers, Inc.





Edgar B. Vinal, Jr., P.E.
Senior Vice President
Cahn Engineers, Inc.



This Phase I Inspection Report on Grupes Reservoir Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

Aramast Mahtesian

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspection. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam would necessarily represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

	<u>Page</u>
Letter of Transmittal	
Brief Assessment	i, ii
Review Board Signature Page	iii
Preface	iv
Table of Contents	v-vii
Overview Photo	viii
Location Map	ix

SECTION 1: PROJECT INFORMATION

1.1	<u>General</u>	1-1
a.	Authority	
b.	Purpose of Inspection Program	
c.	Scope of Inspection Program	
1.2	<u>Description of Project</u>	1-2
a.	Location	
b.	Description of Dam and Appurtenances	
c.	Size Classification	
d.	Hazard Classification	
e.	Ownership	
f.	Operator	
g.	Purpose of Dam	
h.	Design and Construction History	
i.	Normal Operational Procedures	
1.3	<u>Pertinent Data</u>	1-4
a.	Drainage Area	
b.	Discharge at Damsite	
c.	Elevations	
d.	Reservoir	
e.	Storage	
f.	Reservoir Surface	
g.	Dam	
h.	Diversion and Regulatory Tunnel	
i.	Spillway	
j.	Low Area at Service Road	
k.	Regulating Outlets	

SECTION 2: ENGINEERING DATA

2.1	<u>Design</u>	2-1
a.	Available Data	
b.	Design Features	
c.	Design Data	

2.2	<u>Construction</u>	2-1
	a. Available Data	
	b. Construction Considerations	
2.3	<u>Operations</u>	2-1
2.4	<u>Evaluation</u>	2-1
	a. Availability	
	b. Adequacy	
	c. Validity	

SECTION 3: VISUAL INSPECTION

3.1	<u>Findings</u>	3-1
	a. General	
	b. Dam	
	c. Appurtenant Structures	
	d. Reservoir Area	
	e. Downstream Channel	
3.2	<u>Evaluation</u>	3-2

SECTION 4: OPERATIONAL PROCEDURES

4.1	<u>Regulating Procedures</u>	4-1
4.2	<u>Maintenance of Dam</u>	4-1
4.3	<u>Maintenance of Operating Facilities</u> ..	4-1
4.4	<u>Description of Any Warning System in Effect</u>	4-1
4.5	<u>Evaluation</u>	4-1

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1	<u>Evaluation of Features</u>	5-1
	a. General	
	b. Design Data	
	c. Experience Data	
	d. Visual Observations	
	e. Test Flood Analysis	
	f. Dam Failure Analysis	

SECTION 6: STRUCTURAL STABILITY

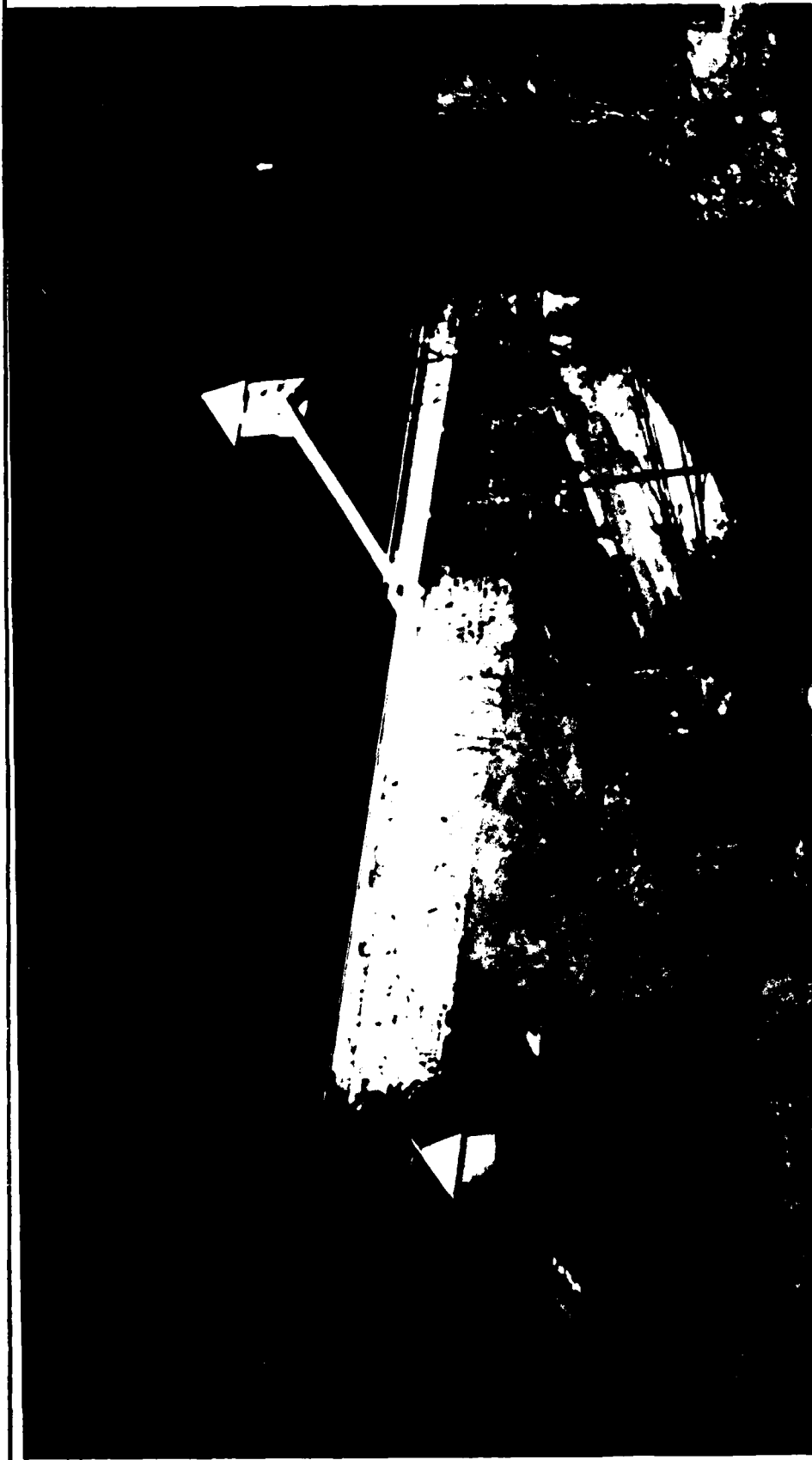
6.1	<u>Evaluation of Structural Stability</u> ...	6-1
	a. Visual Observations	
	b. Design and Construction Data	
	c. Operating Records	
	d. Post Construction Changes	
	e. Seismic Stability	

SECTION 7: ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

- 7.1 Dam Assessment..... 7-1
 - a. Condition
 - b. Adequacy of Information
 - c. Urgency
- 7.2 Recommendations..... 7-1
- 7.3 Remedial Measures..... 7-2
 - a. Operation and Maintenance Procedures
- 7.4 Alternatives..... 7-2

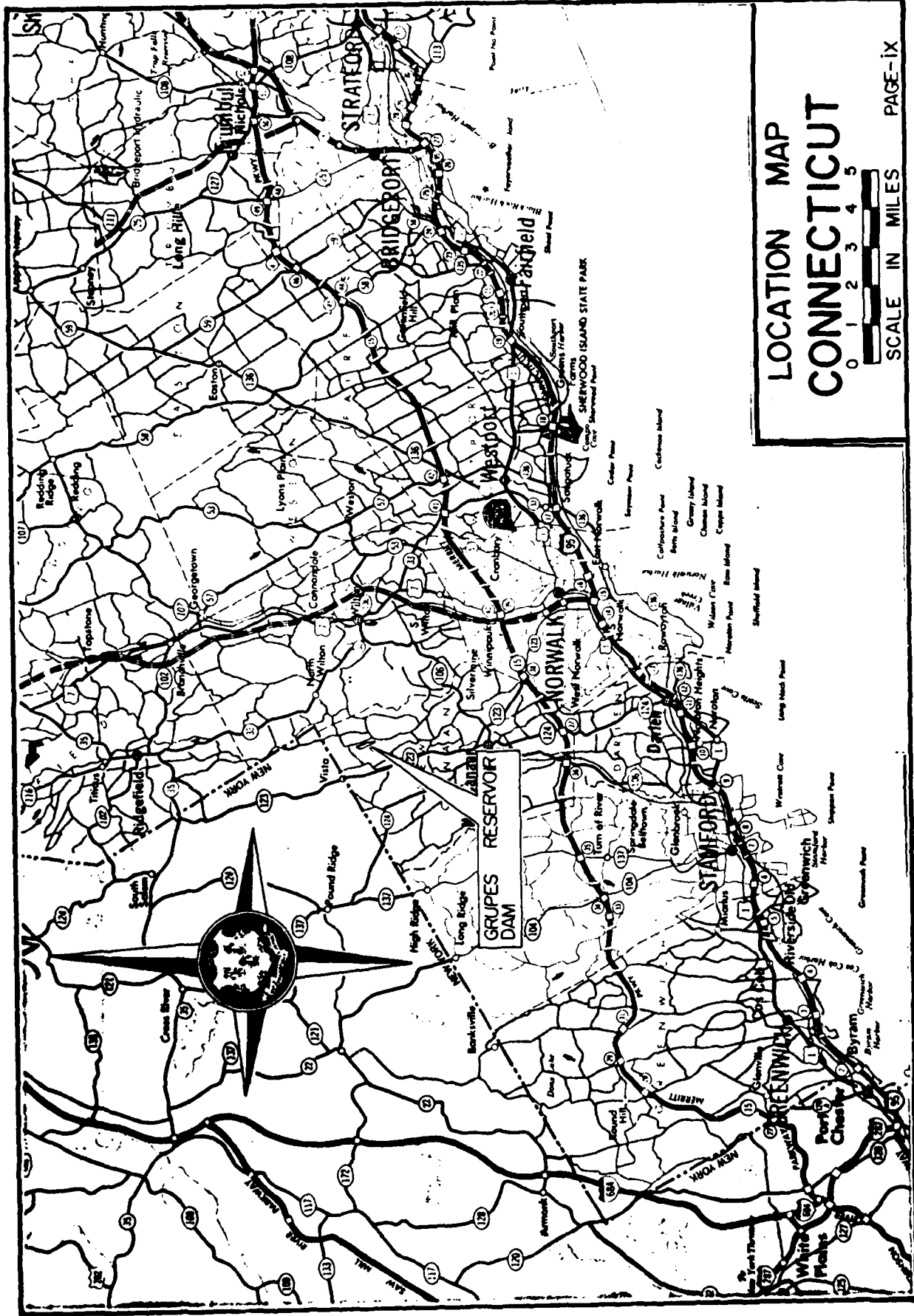
APPENDICES

	<u>Page</u>
APPENDIX A: <u>INSPECTION CHECKLIST</u>	A-1 to A-9
APPENDIX B: <u>ENGINEERING DATA AND CORRESPONDENCE</u>	
Dam Plan, Profile and Sections	Sheet B-1
List of Existing Plans	B-1
Summary of Data and Correspondence	B-2
Data and Correspondence	B-3 to B-41
APPENDIX C: <u>DETAIL PHOTOGRAPHS</u>	
Photograph Location Plan	Sheet C-1
Photographs	C-1 to C-6
APPENDIX D: <u>HYDRAULIC/HYDROLOGIC COMPUTATIONS</u>	
Drainage Area Map	Sheet D-1
Impact Area Map	Sheet D-2
Computations	D-1 to D-17
Preliminary Guidance for Estimating Maximum Probable Discharges	i to viii
APPENDIX E: <u>INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS</u>	E-1



OVERVIEW PHOTO
(November 1979)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS		Grupes Reservoir Dam Silvermine River	New Canaan CONNECTICUT	DATE Dec '79 CE #27 660 KE PAGE viii
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER					



LOCATION MAP
CONNECTICUT

0 1 2 3 4 5
SCALE IN MILES

PHASE I INSPECTION REPORT

GRUPES RESERVOIR DAM

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Cahn Engineers, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Cahn Engineers, Inc. under a letter of October 15, 1979 from William E. Hodgson, Jr. Colonel, Corps of Engineers. Contract No. DACW 33-79-C-0059 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program - The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.
2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dam.
3. To update, verify and complete the National Inventory of Dams.

c. Scope of Inspection Program - The scope of this Phase I inspection report includes:

1. Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.
2. A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.
3. Computations concerning the hydraulics and hydrology of the facility and its relationship to the calculated flood through the existing spillway.
4. An assessment of the condition of the facility and corrective measures required.

It should be noted that this report does not pass judgement on the safety or stability of the dam other than on a visual basis. The inspection is to identify those features of the dam which need corrective action and/or further study.

1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on the Silvermine River in a rural area of the town of New Canaan, County of Fairfield, State of Connecticut. The dam is shown on the Norwalk North USGS Quadrangle Map having coordinates latitude N 41° 11.3' and longitude W 73° 29.3'.

b. Description of Dam and Appurtenances - The dam is a stone and mortar masonry gravity dam, which is 225 feet long and has a typical width of 5.7 feet at the top with a 7 foot wide stone masonry coping. The upstream slope is vertical to about 5 feet below the crest. At this point there is an earth fill which slopes out from the lining at an inclination of 2.5+ horizontal to 1+ vertical. The downstream slope is a 20 foot high vertical stone and mortar masonry face. Both the upstream and downstream slopes are stepped, making the dam 18 feet wide at the base (See Sheet B-1). The top of the dam is at elevation 298.9, which is 27 feet above the Silvermine River and 5.2 feet above the main spillway crest.

The main spillway is a 48.9 foot long and 9.3 foot wide broad-crested masonry weir, located at the left end of the dam. A bridge across the spillway and 6 feet above the weir crest, allows access to the dam from the left abutment. There are stone and mortar masonry walls at either side of the main spillway discharge channel. The left wall is in two sections; the first is 23+ feet high and 25+ feet long and the second abuts the first, slants in toward the spillway channel and is 54+ feet long (See Sheet B-1). The right wall is 5 feet high and 45 feet long. At the low-level gate house, this wall becomes a dry-laid stone wall outlining the downstream channel for approximately 150 feet.

The auxiliary spillway is an unlined channel that is 60+ feet long at the crest and extends around the right end of the dam. There is no weir or sill at the auxiliary spillway, but the crest is approximately 1.4 feet above the main spillway crest, 3.8 feet below the top of the dam or at elevation 295.1.

There is a depression along the service road which runs parallel to the left side of the reservoir. This low area starts at the left abutment of the dam; extends 300+ feet upstream and has a minimum elevation of 296.3 or 2.6 feet below the top of the dam.

The outlet works consist of a series of supply lines, a low-level outlet and an intake gate house. The intake gate house is located 65 feet upstream from the right end of the main spillway and has three 30 inch by 30 inch sluice gates. The low-level sluice gate is at centerline elevation 275.5, the mid-height sluice gate is at centerline elevation 282.0 and the upper level sluice gate is at centerline elevation 288.5. The outlet for the gatehouse is a 24 inch cast iron pipe which leads to the 30 inch upper valve chamber at the right end of the main spillway. From here the 24 inch pipe extends to the 24 inch low-level outlet valve (invert elevation 273.3) at the lower valve chamber (See Sheet B-1).

The main supply line taps the low-level outlet pipe approximately 7 feet upstream from the lower valve chamber and is a 24 inch cast iron pipe which runs parallel to and 35 feet from the downstream face of the dam (See Sheet B-1). Water through the 24 inch supply line can be diverted to either a 20 inch cast iron supply main or to a 16 inch cast iron emergency supply line. The 16 inch pipe has a 24 inch inlet valve (invert elevation 273.3+) at the right end of the dam and also connects to a 12 inch pipe which has been plugged and abandoned. There is also a 24 inch cast iron pipe from the John D. Milne Reservoir which bypasses Grupes Reservoir to the water supply system downstream..

c. Size Classification - (SMALL) - The dam impounds 310 acre-feet of water with the reservoir level at the top of the dam, which at elevation 298.9, is 27 feet above the streambed of the Silvermine River. According to the Recommended Guidelines for height and storage capacity, the dam is classified as small in size.

d. Hazard Classification - (HIGH) - If the dam were breached, there is potential for loss of life and extensive property damage to at least 5 residential structures located between 1500 and 4000 feet downstream along the Silvermine River (See Sheet D-1). There are other residential structures along the Silvermine River to the town of Norwalk which would also be in danger of flooding should the dam fail. The peak outflow before failure of the dam would be 6,300 cfs and the peak failure outflow from the dam breaching would be 24,500 cfs. A breach of the dam would result in a rise of the water level at the initial impact area from a depth of 7.3 feet before failure to a depth of 10.5 feet just after the breach, or a rise of about 3.2 feet in the water level of the stream.

e. Ownership - First District Water Department
3 Belden Avenue
Norwalk, Connecticut
Mr. Richard Kelly (203) 847-9114

f. Operator - William Lahey (Superintendent) (203) 966-1473

g. Purpose of Dam - Water Supply

h. Design and Construction History - The following information is believed to be accurate based on the plans and correspondence available. The dam was built in 1871. In 1901, a 3 foot thick concrete lining was added on the upstream face and in 1905 an auxiliary spillway was added at the right end of the dam. In 1933 the original gate houses were removed and a larger gate house and chlorination facilities were designed by Buck, Seifert and Jost, Inc. and constructed at the dam. In 1962, an attempt was made to grout the dam through holes drilled into the downstream face of the stone masonry. Test borings were also made in consideration of installing a cut-off wall at the dam but according to the operator, the project was never completed. Earth fill was added to the upstream side of the dam, the date of which is unknown.

i. Normal Operation Procedures - The mid-level gate at the intake gate house is normally open and the upper and lower gates are kept closed. Water is drawn from this gate through the 24 inch line to the supply lines. The 24 inch low-level outlet, is kept closed at all times. According to the operator, the valves for the 24 inch low-level outlet and the 16 inch supply line have not been operated since his employment at the water company in the 1950's. The water level is usually maintained at the spillway crest, elevation 293.7.

1.3 PERTINENT DATA

a. Drainage area - 10.2 square miles of rolling and relatively undeveloped wooded terrain. The Grupes Reservoir is the furthest downstream of a series of four reservoirs regulating the Silvermine River for water supply purposes. The other watersheds include 1.9 square miles to Scott's Reservoir, 7.4 square miles to Brown's Reservoir and 9.3 square miles to John D. Milne Lake.

b. Discharge at Damsite - Discharge is over the main spillway, over the auxiliary spillway, over a low area in the service road at the left side of the reservoir (if the water surface gets above elevation 296.3), and through the 24 inch low-level outlet and 16 inch supply line.

1. Outlet Works (conduits):

24 inch low-level outlet
at invert el. 273.3

65 cfs (head to top of
dam)

16 inch emergency supply

N/A

2. Maximum reported flood at
damsite:

Dam overtopped 6" in
October 1955

3. Ungated spillway capacity @
top of dam el. 298.9:

main spillway

2900 cfs (total)

auxiliary spillway

1730 cfs

1170 cfs

4. Ungated spillway capacity @
test flood el. 301.0:

main spillway

4900 cfs (total)

auxiliary spillway

2600 cfs

2300 cfs

5. Gated spillway capacity @
top of dam:

N/A

6. Gated spillway capacity
@ test flood:

N/A

7. Total spillway capacity @
test flood el. 301.0: 4,900 cfs
 8. Discharge through low area
in service road
At top of dam el. 298.9: 3,400 cfs
At test flood el. 301.0: 9,400 cfs
 9. Total project discharge @
top of dam el. 298.9: 6300 cfs
test flood el. 301.0: 16,000 cfs
- c. Elevations (National Geodetic Vertical Datum)
1. Streambed @ centerline of dam: 272₊
 2. Maximum tailwater: Unknown
 3. Upstream portal invert
diversion tunnel: N/A
 4. Recreation pool: N/A
 5. Full flood control pool: N/A
 6. Spillway crest (ungated):
Main spillway: 293.7
Auxiliary spillway: 295.1
 7. Low area at service road: 296.3₊
 8. Design surcharge (original
design): Unknown
 9. Top of dam: 298.9
 10. Test flood surcharge
with service road overflow: 301.0
no service road overflow: 302.2
- d. Reservoir
1. Length of maximum pool: 3500 ft.
 2. Length of recreation pool: N/A
 3. Length of flood control pool: N/A

e. Storage

- | | |
|-------------------------|--------------|
| 1. Recreation pool: | N/A |
| 2. Flood control pool: | N/A |
| 3. Spillway crest pool: | 171 acre-ft. |
| 4. Top of dam: | 311 acre-ft. |
| 5. Test flood Pool: | 370 acre-ft. |

f. Reservoir Surface

- | | |
|-------------------------|----------|
| 1. Recreation pool: | N/A |
| 2. Flood control pool: | N/A |
| 3. Spillway crest pool: | 23 acres |
| 4. Top of dam pool: | 25 acres |
| 5. Test flood pool: | 30 acres |

g. Dam

- | | |
|---------------------|------------------------------|
| 1. Type: | Stone masonry gravity |
| 2. Length: | 225 ft. |
| 3. Height: | 27 ft. |
| 4. Top width: | 5.7 ft. (7 foot wide coping) |
| 5. Side slopes: | vertical |
| 6. Zoning: | N/A |
| 7. Impervious Core: | N/A |
| 8. Cutoff: | N/A |
| 9. Grout curtain: | N/A |
| 10. Other: | Concrete lining upstream |

h. Diversion and Regulatory Tunnel - N/A

i. Spillway

Main Spillway

- | | |
|--------------------|-----------------------|
| 1. Type: | Broad-crested masonry |
| 2. Length of weir: | 48.9 feet |

- 3. Crest elevation: 293.7
- 4. Gates: N/A
- 5. Upstream channel: N/A
- 6. Downstream channel: bedrock and gravel streambed
- 7. General: 6 foot clearance to low chord of access bridge from spillway crest

Auxiliary Spillway

- 1. Type: unlined overflow channel
- 2. Length of crest: 60 feet
- 3. Crest elevation: 295.1
- 4. Gates: N/A
- 5. Upstream channel: N/A
- 6. Downstream channel: sloping, weed covered overflow channel to Silvermine River
- 7. General: N/A

j. Low Area at Service Road

- 1. Length: 300± ft.
- 2. Elevation: 296.3 (minimum elevation)
- 3. Description: unlined swale
- 4. Other: See Appendix D-5

k. Regulating Outlets

Low-level outlet

- 1. Invert: 273.3 (downstream)
- 2. Size: 24 inch
- 3. Description: cast iron
- 4. Control mechanism: Hand operated 30" valve at upper valve chamber
Hand operated 24" valve at lower valve chamber
- 5. Other: 24" cast iron emergency inlet valve for 16" supply line at invert el. 273.3±.

SECTION 2: ENGINEERING DATA

2.1 DESIGN

a. Available Data - The available data consists of a set of plans for the gate house and chlorinator installation, 3 miscellaneous drawings of the dam, correspondence and boring logs. The plans for the gate house and chlorinator is a set of 4 sheets including plan, sections, details and chlorinator layout, and was prepared by Nicholas S. Hill in 1933. The miscellaneous plans include a plan of the dam with boring locations, plan and profile of the auxiliary spillway by C. N. Wood in 1905, and an elevation of the dam with a cross section. The correspondence consists of letters from the Connecticut Water Resources Commission; The First District Water Company; Buck, Seifert and Jost Consulting Engineers; and Mr. Roald Haestad. This correspondence contains information on inspections at the dam, borings done at the dam site in 1962 and a letter from Dr. R. L. Kroll expressing his concern about the bedrock geology and that the dam foundation may contain some calc-silicate gneiss which may present stability problems for the dam.

b. Design Features - The drawings indicate the design features stated previously in this report.

c. Design Data - There were no engineering values, assumptions, test results or calculations available for the original construction or subsequent addition of an upstream gatehouse, chlorine house, and earth fill at the upstream side of the dam.

2.2 CONSTRUCTION

a. Available Data - There is no as-built drawings or construction inspection reports available for the dam.

b. Construction Considerations - No information is available for problems or special considerations for the dam construction.

2.3 OPERATIONS

Lake level readings are taken weekly and recorded. According to the operator and existing available data, there was 6 inches of water over the dam in October 1955. No formal operations records are known to exist at this time.

2.4 EVALUATION

a. Availability - Existing data was provided by the Connecticut Department of Environmental Protection, The First District Water Company and Buck, Seifert and Jost, Consulting Engineers. The owner made the project available for visual inspection.

b. Adequacy - The limited amount of detailed engineering data available was generally inadequate to perform an in-depth assessment of the dam, therefore, the assessment of this dam must be based on visual inspection, performance history, hydraulic computations of spillway capacity and approximate hydrologic judgements.

c. Validity - A comparison of record data and visual observations reveals no significant discrepancies in the record data.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - The general condition of the project is fair. The inspection did reveal several areas requiring maintenance and monitoring. At the time of the inspection the reservoir level was at elevation 293.8, i.e. 5.1 feet below the crest of the dam, with water flowing over the main spillway.

b. Dam

Crest - The crest of the dam is in good condition. No signs of misalignment, spalling or visible cracks were observed (Photo 2).

Upstream Slope - There are cracks in the mortar joints of the masonry, with considerable cracking noted at the right side of the slope in the area of the emergency inlet valve chamber (Photo 1). The top of the concrete lining appears to be in sound condition.

Downstream Slope - No misalignment or signs of movement were observed on this slope. Efflorescence was noted along the mortar joints of this slope (Photo 3). There are several seepage areas on the right side and central portion of the downstream slope (Photos 11 and 12). In this area of the slope, seepage emanated through the numerous cracks in the joints of the stone masonry. In some places, the mortar is completely washed out from between the stones. There are several metal pipes protruding from the downstream slope and are reported to have been used for pressure grouting of the masonry in the 1960's (Photo 12).

There is a 12 inch tile drain pipe which runs from a dry well, which is reported to be located to the right of the chlorine house, to the downstream river channel. (See Sheet B-1). Discharge from this pipe was approximately 10 gpm (Photo 4). A two inch thick deposit of siltation was observed on the bottom of the pipe outlet. The ground in the vicinity of the dry well is wet and according to the dam operator there is water in this area all year long (Photo 10).

Main Spillway - The spillway section of the dam was overflowing with about 2 inches of water and portions of the downstream wall were not visible (Photo 5 through 7). There is a dry-laid stone wall along the left side of the reservoir for several hundred feet upstream from the left spillway wall. This stone wall is showing signs of deterioration near the spillway with some of the stone falling into the spillway approach channel (Photo 5). The downstream spillway walls are stone and mortar masonry. There is considerable deterioration of the left wall immediately downstream of the spillway with cracking of the mortar joints (Photo 6). According to the operator, there are wet areas on the middle and lower sections of the downstream face of the spillway, which are visible when the spillway is dry. The floor of the spillway channel is an outcrop of natural rock with several loose boulders and some brush (Photos 6 and 7). There is a 200 foot long dry-laid stone wall along the right side of the spillway discharge channel.

Auxiliary spillway - The auxiliary spillway is at the right side of the reservoir (Photo 9). It has a grass, brush and stone cover with the remains of a stone wall on both sides of the crest.

c. Appurtenant Structures - The intake gatehouse is in good condition (Photo 2). No cracks or spalling was observed on the external or internal surfaces of the concrete chamber.

The upper 30 inch valve chamber is on the left end of the upstream side of the dam. The inspection of this chamber revealed some leakage through the right upstream corner.

The 24 inch emergency inlet valve chamber on the right end of the upstream side of the dam also had a leak at the right upstream corner of the chamber. Water level in the chamber was approximately even with the water level in the reservoir. The upstream wall of the chamber has many cracks in the mortar joints of the masonry.

The 24 inch low-level outlet chamber is a masonry structure with some signs of cracking and weathering (Photo 7). The other structures at the right downstream toe of the dam, such as the chlorine house, diffuser, venturi and 24 inch valve house are in good condition.

d. Reservoir Area - The area surrounding the reservoir is generally wooded. There is a service road at the left side of the reservoir with a stone wall extending 300 feet along the shore and parallel to the road. The condition of this stone wall is fair. A substantial depression zone in the area of the service road was observed. This low area is located from the left of the dam to 300 feet upstream of the dam and is 2.6+ feet below the crest of the dam.

e. Downstream Channel - The downstream channel runs in the natural bed of the Silvermine River. It is mostly undeveloped, steep-sided and wooded to the initial impact area.

3.2 EVALUATION

Based upon the visual inspection, the project is assessed as being generally in fair condition. The following features which could influence the future condition and/or stability of the project were identified.

1. Seepage through the right portion of the dam and through the body of the spillway could deteriorate the mortar joints and increase the uplift pressure with a subsequent reduction in the stability of the structure.
2. The leaks in the upper 30 inch and 24 inch valve chambers and the cracked mortar joints on the right end of the upstream side of the dam could lead to additional saturation, leaking and deterioration of the masonry of the dam.

3. Damaged mortar joints of the left spillway wall and damage to the stone wall along the right side of the spillway discharge channel could result in erosion problems should these walls become unstable and fail.
4. The 24 inch low-level outlet has not been operated in several years. The condition of this pipe and valve are unknown and could present a problem should there be a need to draw down the reservoir.
5. The pipes through the dam are over 100 years old and the condition of these pipes should be checked.

SECTION 4: OPERATIONAL PROCEDURES

4.1 REGULATING PROCEDURES

Flows are regulated from the filter plant which is located downstream from the dam. Only the mid-level sluice gate at the intake gate house is open for water supply through the 24 inch line. The 16 inch emergency supply line and 24 inch low-level outlet are not operated. The reservoir can be completely eliminated from the water supply system by using the 24 inch bypass from the John. D. Milne Lake.

4.2 MAINTENANCE OF DAM

The grass and brush is cut once a month when the weather permits. All painting and general repair to appurtenant structures is done during the summer months as required.

4.3 MAINTENANCE OF OPERATING FACILITIES

The gates at the intake gate house are cleaned and serviced once a year. Screens for these gates are checked and cleaned on a weekly schedule.

4.4 DESCRIPTION OF ANY FORMAL WARNING SYSTEM IN EFFECT

No formal warning system is in effect, but the operator does notify the Civil Defense if the water level at the main spillway rises to 1.8 feet below the top of the dam.

4.5 EVALUATION

The operation and maintenance procedures are generally good, however there are some areas requiring improvement. A more formal program of operation and maintenance procedures should be implemented, including schedules, periodic inspections and documentation to provide complete records for future reference. Remedial operation and maintenance recommendations are presented in Section 7.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. General - The watershed is 10.2 square miles of rolling and relatively undeveloped wooded terrain. The Grupes Reservoir is the furthest downstream of a series of four reservoirs regulating the Silvermine River for water supply purposes. The other watersheds include 1.9 square miles to Scott's Reservoir, 7.4 square miles to Brown's Reservoir and 9.3 square miles to John D. Milne Lake. The dam is a masonry structure with a main spillway incorporated into the left end of the dam and an auxiliary spillway consisting of an unlined channel at the right side of the reservoir. A low area exists at the service road to the left of the dam. This area extends 300+ feet upstream from the dam and has a minimum elevation of 296.3. The dam is basically a low surcharge storage - high spillage project which does not develop sufficient storage to generate a significant reduction in either the Probable Maximum Flood (PMF) or the 1/2 PMF.

b. Design Data - No computations could be found for the original dam construction.

c. Experience Data - No information on serious problem situations arising at the dam was found. There was 6 inches of water over the dam in October 1955 according to the operator.

d. Visual Observations - The dam and appurtenant structures appear to be well maintained. There is an access bridge which extends across the main spillway approximately 6 feet above the spillway crest. Several low hanging branches were noted at the auxiliary spillway and water flowing over this spillway will be channeled around the right end of the dam to the Silvermine River approximately 250 feet downstream from the dam. Flows over the service road will go around the left end of the dam and back to the Silvermine River several hundred feet downstream.

e. Test Flood Analysis - Based upon the Army Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharge" dated March 1978, the watershed classification (rolling) and area (10.2 square miles), a Probable Maximum flood (PMF) of 16,300, or 2000 cfs per square mile, is expected at the dam site. In accordance with the size (small) and hazard (high) classification, the test flood range to be considered is from the 1/2 PMF to the PMF. Peak inflow to the reservoir at the PMF is 16,300 cfs (Appendix D-2) and peak outflow is 16,000 cfs. Peak inflow to the reservoir at the 1/2 PMF is 8150 cfs and peak outflow is 7900 cfs. The test flood for Grupes reservoir Dam is considered to be equivalent to the PMF.

Assuming the low area at the service road is not raised to the elevation of the dam, the dam will be overtopped 2.1 feet (elevation 301.0), the spillway capacities will be 2600 cfs (main) and 2300 cfs (auxiliary), and the overflow at the service road will be 9400 cfs. If the low area at the service road is raised to the elevation of the dam, the dam will be overtopped to a depth of 3.3 feet, or to elevation 302.2.

If the service road overflow is not considered as spillway outflow, the capacity of the spillways just before the dam is overtopped is 2900 cfs or 18% of the routed test flood outflow. If the service road outflow is considered as spillway outflow, the spillway capacity just before the dam is overtopped is 6300 cfs or 39% of the routed test flood outflow.

f. Dam Failure Analysis - Utilizing the Army Corps of Engineers' April, 1978 "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", the peak outflow before failure would be 6300 cfs (including low area) and the peak failure outflow from the dam breaching would be 24,500 cfs. A breach of the dam would result in a rise of about 3.2 feet in the water level of the stream at the initial impact area, which corresponds to an increase in the water level from a depth of 7.3 feet just before the breach to a depth of 10.5 feet just after the breach. The rapid 3.2 foot increase in the water level at the initial and secondary impact areas would inundate at least 3 houses located approximately 1400 to 3500 feet downstream to a depth of about 3 feet. There are several other houses located close to the streambed along the Silvermine River between the secondary impact area and the town of Norwalk. These houses would also be in danger of flooding if the dam were breached.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - The visual inspection did not reveal any indications of immediate stability problems. However, there is seepage through the body of the dam which could jeopardize the stability of the dam if left uncontrolled. A boring program implemented at the dam in 1962 and visual observations by Dr. Richard Kroll (Section 6.1.c), indicate that the bedrock foundation may be fractured and contain weak layers. Due to the above considerations, and the present geometry and age of the structure, a more detailed investigation of the dam and existing data should be performed to determine the necessity of a stability analysis.

b. Design and Construction Data - The drawings and data available and listed in Appendix B were not sufficient to perform an in-depth stability analysis of the dam. No engineering assumptions, data or calculations could be found for the original design of the dam.

c. Operating Records - The boring program implemented in December 1962 and January 1963 at the downstream toe of the dam, indicated that the rock foundation was highly fractured and contained bands of soft material. Also, in a letter to Dr. Joe Webb Peoples on June 27, 1972, Dr. Richard Kroll expressed his concern about possible solution of calcite layers in the bedrock foundation of the dam. Evidently this was not considered a stability problem at this time, as no follow-up correspondence could be found to indicate any concern over this situation.

d. Post Construction Changes - The post-construction changes of the project include the following data:

1. Construction of a new auxiliary spillway at the right end of the dam in 1905.
2. Addition of a 3 foot lining on the upstream slope.
3. Construction of a new concrete and brick intake gate house and removal of the original structures in 1933.
4. Improvement of the existing chlorine house and venturi valve at the downstream toe in 1933.
5. Addition of earth fill at the upstream side of the dam.

e. Seismic Stability - The project is in Seismic Zone I and according to the Recommended Guidelines, need not to be evaluated for seismic stability.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 PROJECT ASSESSMENT

a. Condition - Based upon the visual inspection of the site and past performance, the project appears to be in fair condition. The masonry is generally in fair condition with areas of some concern which require maintenance and monitoring.

Based upon the Army Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharge" dated March, 1978, and hydraulic/hydrologic computations, the peak inflow to the reservoir at the test flood is 16,300 cubic feet per second (cfs) and the peak outflow is 16,000 cfs, with the dam overtopped 2.1 feet (elevation 301.0) and flow over the low area in the service road. Based upon our hydraulic computations, the spillway capacity with the reservoir level to the top of the dam is 2,900 cfs (not including service road overflow), which is equivalent to approximately 18% of the routed test flood outflow.

b. Adequacy of Information - The information available is such that an assessment of the condition and stability of the project must be based solely on visual inspection, past performance and sound engineering judgement.

c. Urgency - It is recommended that the measures presented in Section 7.2 and 7.3 be implemented within 1 year of the owner's receipt of this report.

7.2 RECOMMENDATIONS

It is recommended that further studies be made by a registered professional engineer qualified in dam design and inspection pertaining to the following:

1. A detailed hydraulic/hydrologic analysis to assess the overflow section at the service road as an auxiliary spillway. Recommendations should be made by the engineer and implemented by the owner.
2. A Further investigation and inspection of the project and make any necessary recommendations. Items of particular importance are as follows:
 - a. Evaluation of the need for a dam stability analysis at test flood conditions. This analysis could require implementation of a boring program, piezometer installation and material testing.
 - b. The condition of the dry well on the right side of the dam toe and the development of measures to control drainage at the wet area surrounding this well. Also the origin and significance of seepage flow from the 12 inch tile drain pipe.

- c. Condition of the main spillway when it is not overflowing.
- d. Condition of the dam upstream face and the concrete lining.
- e. The cracking and leakage through the mortar joints in the upstream walls of the upper 30 inch and the emergency intake valve chambers.
- f. Condition of the 16 and 24 inch pipes through the dam. These pipes could be deteriorated and produce additional seepage flow through the dam.
- g. Monitoring of seepage through the dam, the upper valve chambers and through the 12 inch tile drain pipe to measure any changes in seepage quantities. Any acceptable repair measures to reduce or stop seepage through the dam and spillway should be implemented.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedures - The following measures should be undertaken and continued on a regular basis.

- 1. Round-the-clock surveillance should be provided by the owner during periods of heavy precipitation or high project discharge at the dam. The owner should develop and implement a downstream warning system to be used in case of emergencies at the dam.
- 2. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future references.
- 3. A comprehensive program of inspection by a registered professional engineer qualified in dam inspection should be instituted on an annual basis.
- 4. Cracked masonry joints on the upstream slope of the dam and the upper 24 inch and emergency intake valve chambers should be sealed to prevent masonry deterioration and water penetration to the dam.
- 5. Deteriorated areas of the masonry and stone spillway training walls and the stone wall along the left shore of the reservoir should be repaired to prevent erosion of the banks and to increase the stability of these walls.
- 6. The cutting of grass and brush on the toe and abutments of the dam, as well as at the auxiliary spillway should be continued as part of the routine maintenance procedure.

7.4 ALTERNATIVES

This study has identified no practical alternatives to the above recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT GRUPES RESERVOIR DAM

DATE: NOVEMBER 5, 1979

TIME: 10:00 - 12:00 PM

WEATHER: SUNNY, 50°F

W.S. ELEV. 2938 U.S. _____ DN. S

PARTY:

INITIALS:

DISCIPLINE:

1. <u>PETER M. HEYDEN</u>	<u>PMH</u>	<u>Geotechnical</u>
2. <u>MIRON PETROVSKY</u>	<u>MP</u>	<u>Geotechnical</u>
3. <u>JAY COSTELLO</u>	<u>JC</u>	<u>Geotechnical</u>
4. <u>HECTOR MORENO</u>	<u>HM</u>	<u>Hydraulic/Hydrologic</u>
5. <u>WILLIAM LAHEY</u>	<u>W.L.</u>	<u>Owner Representative</u>
6. <u>FRANK SEGALINE</u>	<u>F.S.</u>	<u>Survey</u>

PROJECT FEATURE

INSPECTED BY

REMARKS

1. <u>MASONRY DAM</u>	<u>PMH, MP, JC, F.S.</u>	
2. <u>INTAKE GATEHOUSE</u>	<u>PMH, MP, JC,</u>	
3. <u>UPPER VALVE CHAMBERS</u>	<u>MP, JC</u>	
4. <u>LOW-LEVEL VALVE CHAMBER</u>	<u>PMH, MP, JC,</u>	
5. <u>LOWER VALVE CHAMBER</u>	<u>MP, JC</u>	
6. <u>PRINCIPAL SPILLWAY</u>	<u>PMH, MP, JC, F.S.</u>	
7. <u>AUXILIARY SPILLWAY</u>	<u>PMH, MP, JC, F.S.</u>	
8. _____		
9. _____		
10. _____		
11. _____		
12. _____		

PERIODIC INSPECTION CHECK LIST

Page A-2PROJECT GRUPES RESERVOIR DAMDATE Nov. 5, 1979PROJECT FEATURE MASONRY DAMBY PMH, MP, JC, FS

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation	298.9
Current Pool Elevation	293.8
Maximum Impoundment to Date	UNKNOWN
Surface Cracks	SOME, ON U/S SLOPE
Pavement Condition	N/A
Movement or Settlement of Crest	NONE OBSERVED
Lateral Movement	
Vertical Alignment	APPEARS GOOD
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	GOOD
Indications of Movement of Structural Items on Slopes	NONE OBSERVED
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection-Riprap Failures	N/A
Unusual Movement or Cracking at or Near Toes	NONE OBSERVED
Unusual Embankment or Downstream Seepage	Seeps ON D/S SLOPE & WET AREA AT TOE
Piping or Boils	NONE OBSERVED
Foundation Drainage Features	UNKNOWN
Toe Drains	HORIZONTAL TOE DRAIN WITH FLOW OF 10 [±] gpm
Instrumentation System	N/A

A-2

PERIODIC INSPECTION CHECK LIST

Page A-3

PROJECT GRUPES RESERVOIR DAM

DATE NOV. 5, 1979

PROJECT FEATURE INTAKE GATEHOUSE

BY PMH, MP, JC.

AREA EVALUATED	CONDITION
<u>OUTLET WORKS-CONTROL TOWER</u>	
a) <u>Concrete and Structural</u>	
General Condition	GOOD
Condition of Joints	NOT OBSERVED
Spalling	NONE OBSERVED
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	NOT OBSERVED
Unusual Seepage or Leaks in Gate Chamber	NONE OBSERVED
Cracks	
Rusting or Corrosion of Steel	
b) <u>Mechanical and Electrical</u>	
Air Vents	N/A
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	3 SLUICES GATES OF 30"x30", OPERABLE
Service Gates	
Emergency Gates	
Lightning Protection System	N/A
Emergency Power System	GOOD
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

Page A-4

PROJECT GRUPAS RESERVOIR DAM

DATE Nov. 5, 1979

PROJECT FEATURE UPPER SERVICE VALVE CHAMBER

BY MP, JC

AREA EVALUATED	CONDITION
<u>OUTLET WORKS-CONTROL TOWER</u>	MASONRY STRUCTURE WITH CONCRETE LIVING ON U/S SLOPE
a) <u>Concrete and Structural</u>	
General Condition	FAIR
Condition of Joints	N/A
Spalling	NONE OBSERVED
Visible Reinforcing	N/A
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	SOME EFFLORESCENCE
Joint Alignment	N/A
Unusual Seepage or Leaks in Gate Chamber	SEEP ON RIGHT CORNER
Cracks	SOME, U/S SLOPE
Rusting or Corrosion of Steel	N/A
b) <u>Mechanical and Electrical</u>	
Air Vents	
Float Wells	
Crane Hoist	N/A
Elevator	
Hydraulic System	
Service Gates	24" GATE VALVE, OPERABLE
Emergency Gates	
Lightning Protection System	N/A
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

Page A-5

PROJECT GRUPES RESERVOIR DAM

DATE NOV. 5, 1979

PROJECT FEATURE UPPER EMERGENCY VALVE CHAMBER

BY MP, JC

AREA EVALUATED	CONDITION
<u>OUTLET WORKS-CONTROL TOWER</u>	MASONRY STRUCTURE WITH CONCRETE LINING ON U/S SLOPE
a) <u>Concrete and Structural</u>	
General Condition	FAIR
Condition of Joints	N/A
Spalling	SOME, MASONRY U/S SLOPE
Visible Reinforcing	N/A
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	SOME EFFLORESCENCE
Joint Alignment	N/A
Unusual Seepage or Leaks in Gate Chamber	SEEP ON RIGHT CORNER
Cracks	CRACKS OF 1/8" - 1/4" WIDE ON U/S SLOPE
Rusting or Corrosion of Steel	N/A
b) <u>Mechanical and Electrical</u>	
Air Vents	
Float Wells	
Crane Hoist	N/A
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	16" GATE VALVE , OPERABLE
Lightning Protection System	
Emergency Power System	N/A
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

Page A-6

PROJECT GRUPES RESERVOIR DAM

DATE Nov. 5, 1979

PROJECT FEATURE LOW-LEVEL VALVE CHAMBER

BY PMH, MP, JC.

AREA EVALUATED		CONDITION
<u>OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL</u>		
General Condition of Concrete		Good
Rust or Staining		
Spalling		
Erosion or Cavitation		
Visible Reinforcing		
Any Seepage or Efflorescence		
Condition at Joints		
Drain Holes		
Channel		
Loose Rock or Trees Overhanging Channel		
Condition of Discharge Channel		

PERIODIC INSPECTION CHECK LIST

Page A-7

PROJECT GRUPES RESERVOIR DAM

DATE NOV. 5, 1979

PROJECT FEATURE LOWER VALVE CHAMBER

BY MP, JC

AREA EVALUATED	CONDITION
<u>OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
General Condition of Concrete	Good
Rust or Staining	
Spalling	
Erosion or Cavitation	NONE OBSERVED
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	
Channel	N/A
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

PERIODIC INSPECTION CHECK LIST

Page A-8PROJECT GRUPES RESERVOIR DAMDATE NOV. 5, 1979PROJECT FEATURE PRINCIPAL SPILLWAYBY PMH, MP, JC, HM, FS

AREA EVALUATED	CONDITION
<u>OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	<u>MASONRY STRUCTURE</u>
a) <u>Approach Channel</u>	
General Condition	GOOD
Loose Rock Overhanging Channel	} NONE OBSERVED
Trees Overhanging Channel	
Floor of Approach Channel	
b) <u>Weir and Training Walls</u>	
General Condition of Concrete	FAIR
Rust or Staining	N/A
Spalling	DAMAGED TRAIN WALL NEAR WEIR
Any Visible Reinforcing	N/A
Any Seepage of Efflorescence	SOME
Drain Holes	N/A
c) <u>Discharge Channel</u>	
General Condition	GOOD
Loose Rock Overhanging Channel	} NONE OBSERVED
Trees Overhanging Channel	
Floor of Channel	BEDROCK
Other Obstructions	BOULDERS & BRUSH

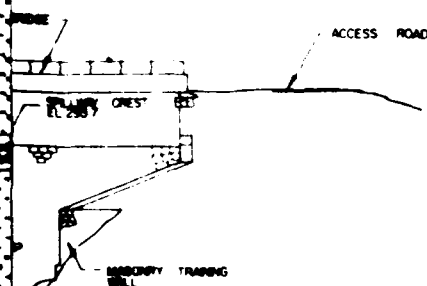
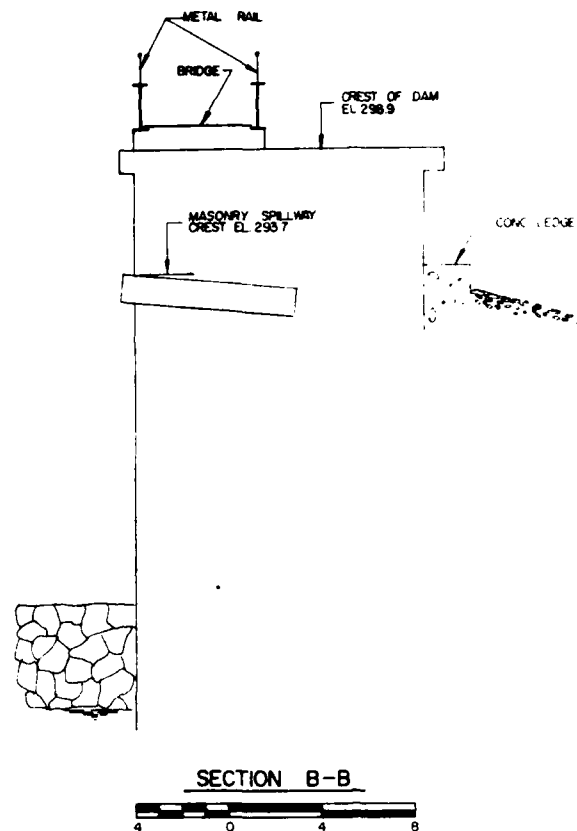
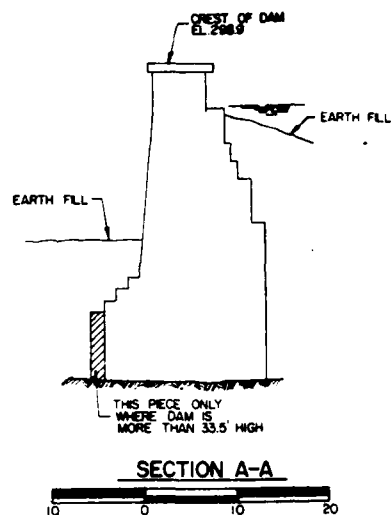
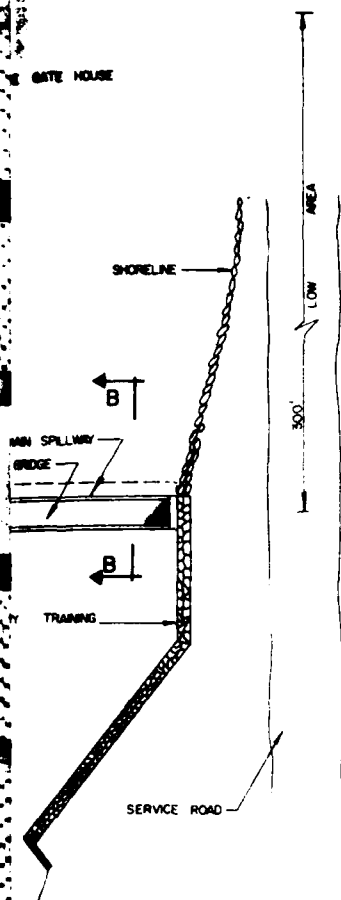
PERIODIC INSPECTION CHECK LIST

Page A-9PROJECT GRUPES RESERVOIR DAMDATE Nov. 5, 1979PROJECT FEATURE AUXILIARY SPILLWAYBY PMH, MP, JC, HM, ES

AREA EVALUATED	CONDITION
<u>OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a) <u>Approach Channel</u>	
General Condition	FAIR
Loose Rock Overhanging Channel	NONE OBSERVED
Trees Overhanging Channel	SOME
Floor of Approach Channel	NATURAL GROUND
b) <u>Weir and Training Walls</u>	
General Condition of Concrete	FAIR
Rust or Staining	N/A
Spalling	SOME, STONE WALLS
Any Visible Reinforcing	N/A
Any Seepage or Efflorescence	NONE OBSERVED
Drain Holes	N/A
c) <u>Discharge Channel</u>	
General Condition	FAIR
Loose Rock Overhanging Channel	NONE OBSERVED
Trees Overhanging Channel	SOME
Floor of Channel	NATURAL GROUND
Other Obstructions	BOULDERS & BRUSH

APPENDIX B

ENGINEERING DATA AND CORRESPONDENCE



NOTES:

- 1 THIS PLAN WAS COMPILED FROM EXISTING PLANS DRAWN IN 1933 AND 1962 AND OBTAINED FROM THE NORWALK FIRST DISTRICT WATER DEPARTMENT. NOT ALL TOPOGRAPHIC AND/OR STRUCTURAL FEATURES ARE NECESSARILY IDENTIFIED.
- 2 ALL ELEVATIONS ARE ASSUMED NGVD TAKEN FROM EXISTING PLANS.

CAHN ENGINEERS INC WALLINGFORD, CONNECTICUT ENGINEER		U S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS PLAN, ELEVATION & SECTIONS			
GRUPES RESERVOIR DAM			
SILVERHOLE RIVER		NEW CANAAN, CONNECTICUT	
DRAWN BY	CHECKED BY	APPROVED BY	SCALE AS NOTED
M.W.	JAC	PHH	DATE NOV 1979 SHEET B-1

2

EXISTING DATA

"Grupe Dam Survey"
No Date

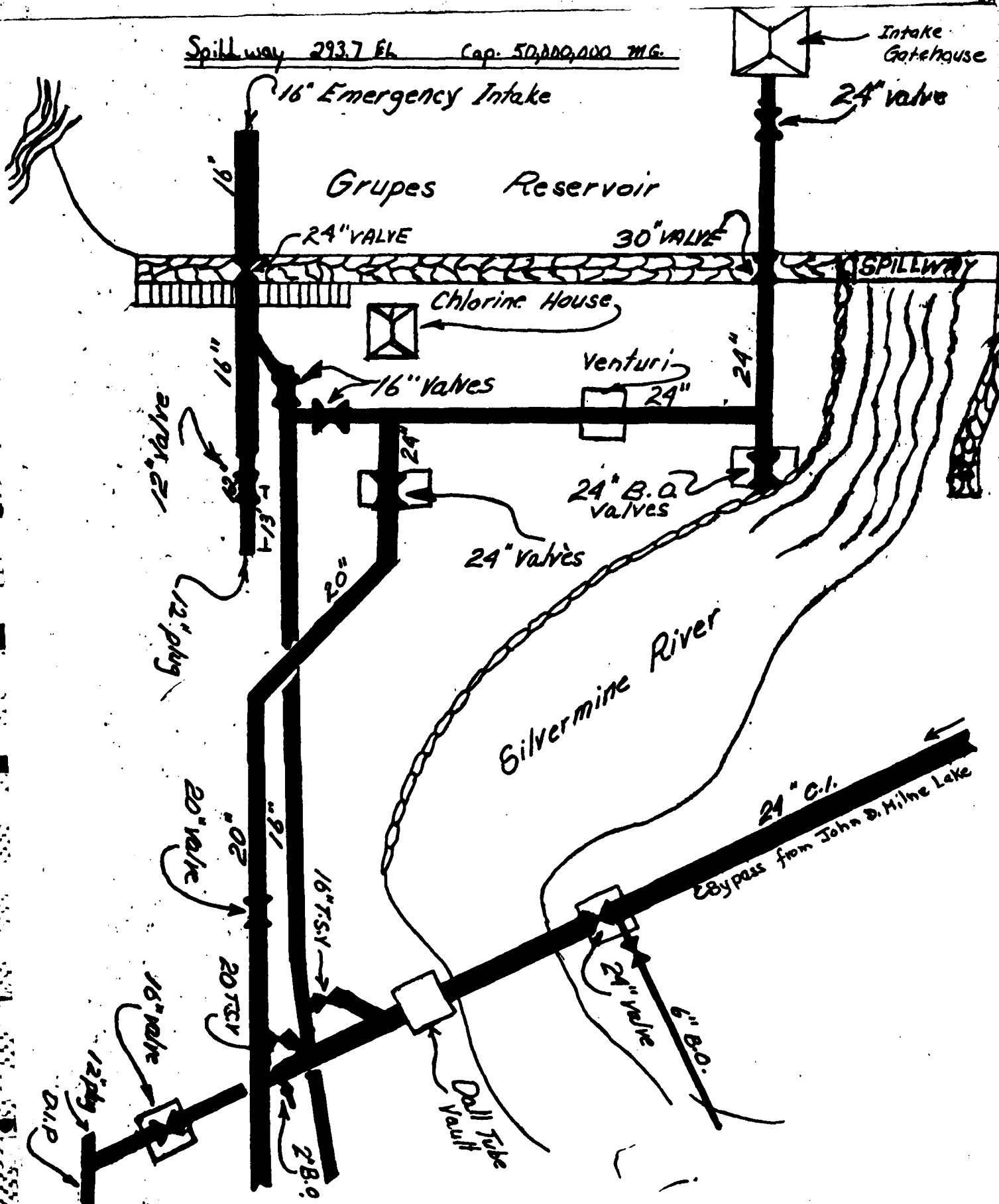
Elevation View of Dam with Cross Section
No Date

"Plan and Profile Map"
Proposed Spillway at Grupes Reservoir
C. N. Wood, C.E.
1905

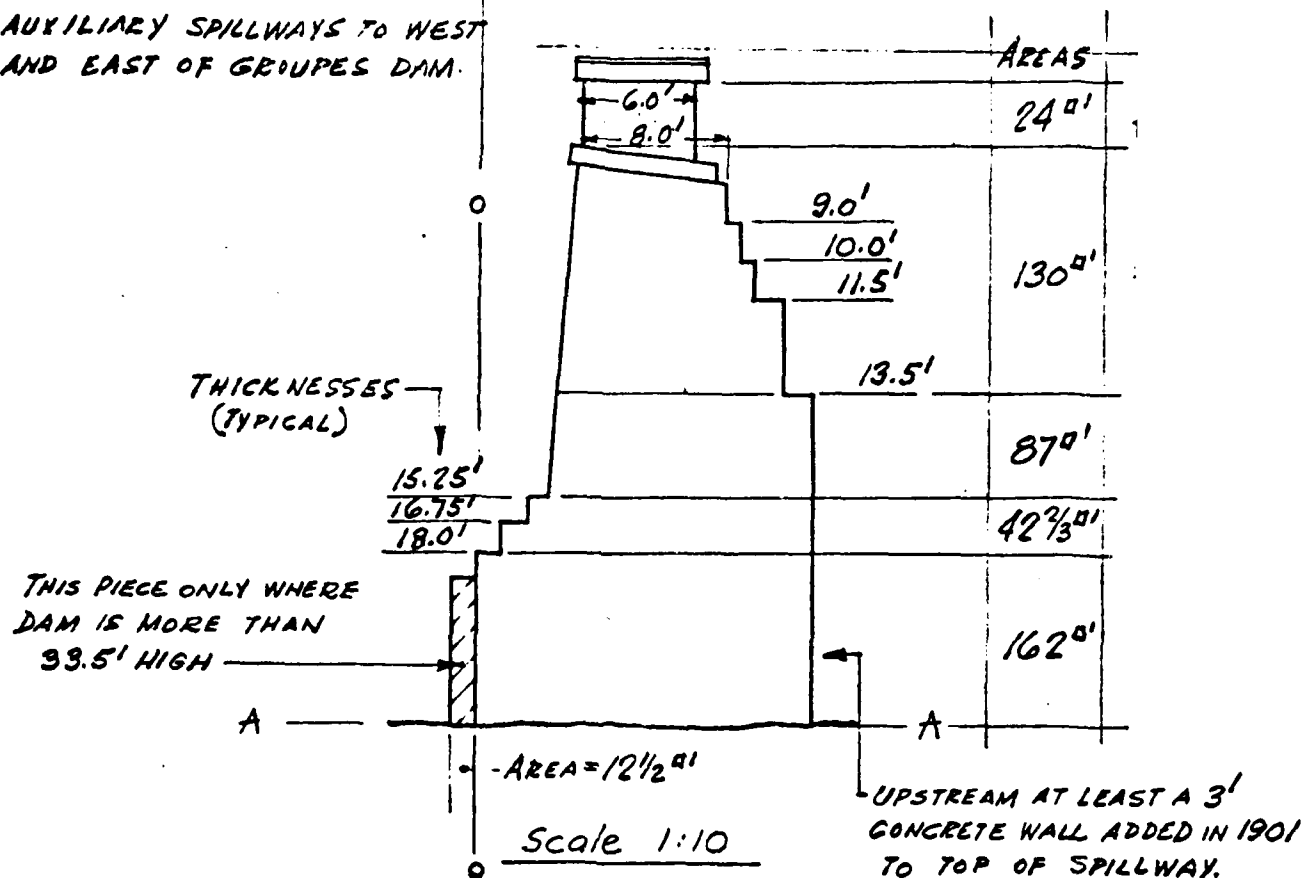
"Improvements to Waterworks System,
Intake and Screen Chamber"
Nicholas S. Hill, Jr., C.E.
New York, New York
1933
4 Sheets

SUMMARY OF DATA AND CORRESPONDENCE

<u>DATE</u>	<u>TO</u>	<u>FROM</u>	<u>SUBJECT</u>	<u>PAGE</u>
No Date	File	Norwalk Water Department, First District	Pipeline arrangement for Grupes Reservoir	B-3
No Date	File	Buck, Seiffert and Jost	Typical Section with comments	B-4
Oct. 31, 1962	Soil testing, Inc.	Charles F. Jost Buck, Seiffert and Jost	Borings to be made at Grupes Dam	B-5
Dec. 1962, Jan. 1963	Norwalk First Tax- ing District	Soil Testing Inc.	Boring logs at Grupes Dam	B-7
April 15, 1965	File	Connecticut Water Resources Commission	Inventory Data	B-37
June 27, 1972	Dr. J.W. Peoples	Richard L. Knoll	Bedrock geology at Grupes Dam	B-38
Sept. 5, 1972	File	Mr. Roald Haestad	References for Grupes Dam	B-39
Sept. 14, 1972	Mr. W.H. O'Brian, Connecticut Dept. of Environmental Protection	Mr. Roald Haestad	Inspection Report	B-41



FLOOD OVERTOPPED DAM BY 6"
 NEW DAM HAD 3' DISCHARGE
 WAS FULL PRIOR TO FLOOD
 AUXILIARY SPILLWAYS TO WEST
 AND EAST OF GROUPES DAM.



WEST ABUTMENT 170' LONG
 SPILLWAY 51' LONG
 SPILLWAY ELEV. 2937 TOP 5' ABOVE
 MAXIMUM HEIGHT 36'

OCT. 15	7:00 A.M.	3.13
	9:50 A.M.	1.45
	2:10 P.M.	0.58
	6:00 P.M.	1.95
	8:30 P.M.	1.68
	10:45 P.M.	2.00
OCT. 16	7:00 A.M.	2.70
	4:45 P.M.	0.13
OCT. 17		0.39

BUCK, SEIFERT AND JOST
CONSULTING ENGINEERS
112 EAST 19TH STREET
NEW YORK 3, N. Y.

October 31, 1962

SUBJ: 401.12

Soiltesting, Inc.
47 Pershing Drive
Ansonia, Connecticut

Attention: Mr. Robert De Angelis

Re: First Taxing District
Norwalk, Connecticut
Grupe Dam

Gentlemen:

We are enclosing herewith a drawing showing the locations for a program of test borings required by us in connection with a study for reinforcing the existing Grupe Dam of the First Taxing District of the City of Norwalk, Connecticut. The location of the Reservoir is shown on the Norwalk North Quadrangle of the U. S. G. S. maps.

The borings shall be made from the surface of the ground to ledge rock and shall be carried a minimum of five feet into the ledge rock. The borings through the overburden shall be made by the dry sample method, in which the hole is cased to the rock. Samples shall be taken every five feet and at other intervals where a change in formation is indicated, by driving the casing to the desired depth, cleaning out the hole to the bottom of the casing and by driving a sample spoon of approved design not less than eighteen inches below the bottom of the casing into the material. The number of blows per foot to drive the casing and the number of blows for each six inches of sample spoon penetration shall be recorded. Samples shall be preserved in clear glass jars with air-tight covers, waxed after closing. Drilling into ledge shall be done with a core barrel and a diamond bit or other approved means which will produce a core from the rock penetrated of not less than one and three eighth inches in diameter. The drilling shall be done in such a manner

October 31, 1962

as to obtain the maximum possible core recovery. Cores shall be preserved in wooden boxes in the order in which they were taken.

Copies of the logs of the borings with complete information shall be forwarded to this office as soon as possible after each hole is completed. After completion of the work the samples and rock cores shall be delivered to the office of the First Taxing District at 3 Belden Avenue, Norwalk.

The work will be performed under our supervision and field inspection.

We will appreciate it if you will submit to us a proposal for performing this work. We suggest that the proposal be in the form of a lump sum on-and-off charge, a unit price per foot for borings through the overburden and a unit price per foot for borings in the rock. The proposal should be addressed to:

Commissioners, First Taxing District
City of Norwalk, Connecticut
c/o Buck, Seifert and Jost
Consulting Engineers
112 East 19th Street
New York 3, New York

The location of the holes will be staked in the field on Friday November 2nd, weather permitting.

We would like to have this work done coincident with or immediately following the boring program you are now doing for us for the Second Taxing District.

If you have any questions in connection with this program please let us know.

Yours very truly,

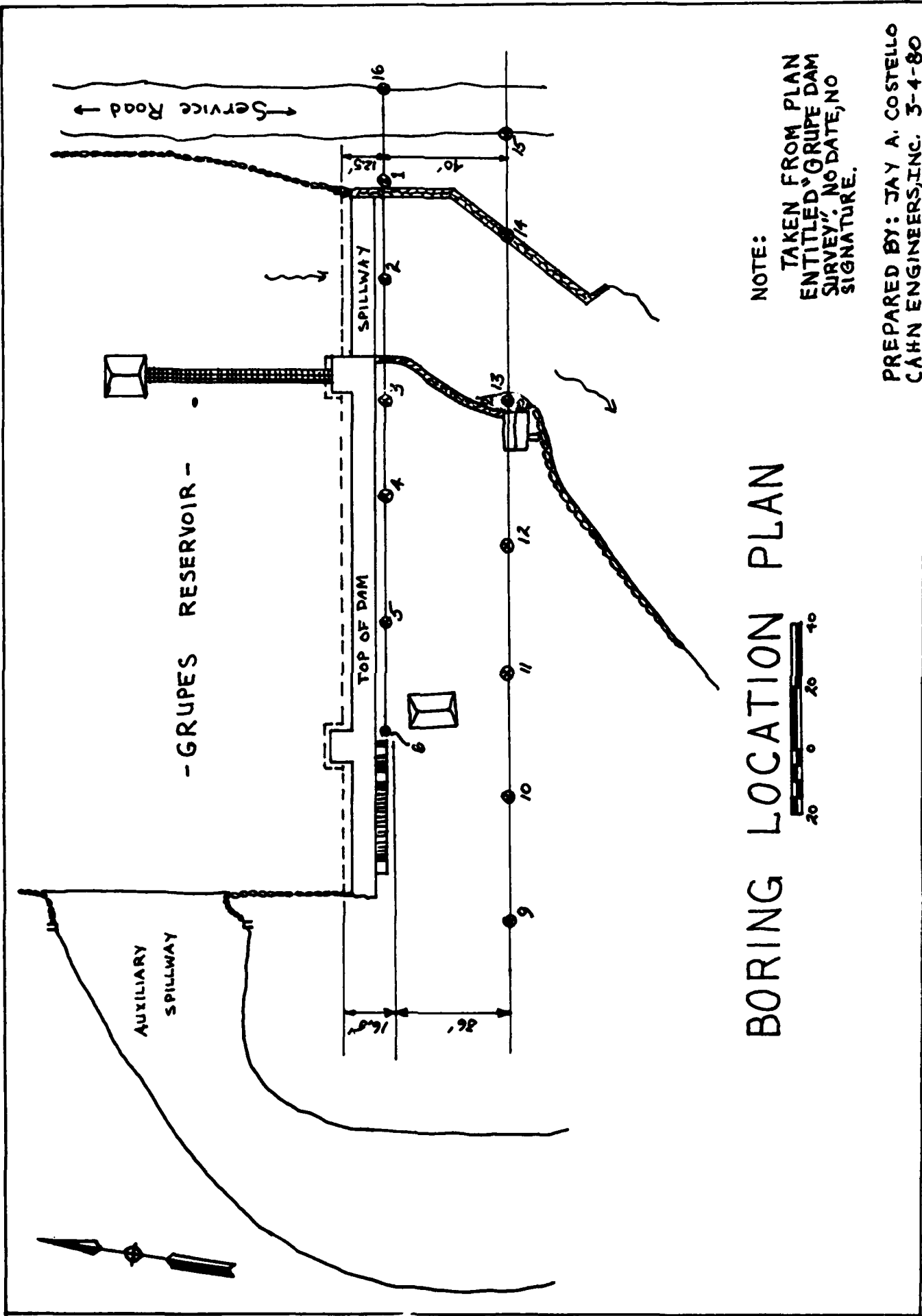
BUCK, SEIFERT AND JOST


Charles F. Jost

CFJ/dm

Enc.

cc: Mr. Riordan ✓



SOILTESTING, INC.

47 Perahing Drive—Ansonia, Conn.

CLIENT 1st. Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO 1

CONTRACTOR

PROJECT NO

LINE

FOREMAN DRILLER
J.D. A.J.

PROJECT NAME

STATION

INSPECTOR

LOCATION

OFFSET

Grupe Dam

New Canaan, Conn.

10' East of #1

GROUND WATER OBSERVATIONS

AT _____ FT AFTER _____ HOURS

AT _____ FT AFTER _____ HOURS

TYPE WI CASING 24" SAMPLER SS CORE BAR D.T.
SIZE ID 24" 1 3/8"
HAMMER WT 300 140 BIT
HAMMER FALL 24" 30" Dia.

Date Start 1/3/63 Date Fin 1/3/63

SURFACE ELEV _____

GROUND WATER ELEV NONE

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT	0-6	6-12	12-18			
220												Boulders and loose fill. Heavy concentration of boulders.
240												
188												
240												
490											5'0"	
310	1	D	O	O		5'0"	150		C	4	Run #1	Recovered 5" misc. boulders.
365			Refusal						C	2		
406									C	1		
581									C	4	9'0"	
538	2	D	O	O		10'0"	100		C	3	10'0"	
			Refusal						C	4		Recovered 23" of fragmented Quartzite, Gneiss & Shist.
									C	5		
									C	5		
									C	6		
									C	5	15'0"	
												Bottom hole 15' 0"

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT

HOLE NO. 1

D DRY W WASHED C CORED P PIT A AUGER UP UNDISTURBED PISTON
UB UNDISTURBED BALL CHECK T THINWALL V VANE TEST

PROPORTIONS USED TRACE = 0-10% LITTLE = 10-20% SOME = 20-35% AND = 35-50%

B-8

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 2

CONTRACTOR

PROJECT NO.

LINE

FOREMAN - DRILLER

PROJECT NAME

STATION

J.D. A.J.

Grupa Dru

INSPECTOR

LOCATION New Canaan, Conn.

OF SET 8th S.E. of #2

GROUND WATER OBSERVATIONS

AT FT AFTER _____ HOURS

AT FT AFTER _____ HOURS

TYPE

SIZE 10

HAMMER WT

HAMMER FALL

CASING

WI

الحمد لله

300

SAMPLER

SS

 $1\frac{3}{8}$

140

CORE BAR

D.T.

© 2000 Blackwell Science Ltd

817

Date Start 1-4-63 Date Fig. 1-4-63

SURFACE ELEV _____

GROUND WATER ELEV.

[illegible]

GROUND SURFACE TO _____ FT. USED _____" CASING THEN _____" CASING TO _____ FT.

HOLE NO.

0 DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
 UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE : 0-10%, LITTLE : 10-20% SOME : 20-35%, AND : 35-50%

B-9

47 Pershing Drive—Ansonia, Conn.

CLIENT: ~~Norwalk, Conn.~~

SHEET 1 OF 1
HOLE NO 4

CONTRACTOR

PROJECT NO

LINE

FOREMAN --DRILLER
T.H. M.N.

PROJECT NAME
Grupe Dam

STATION

INSPECTOR

LOCATION **New Canaan, Conn.**

OFFSET

GROUND WATER OBSERVATIONS

TYPE

CSITG

SAMPLER

POST BAR

Date Start 12/28 Date Exp. 12/28/63

AT FT AFTER _____ HOURS

SIZE 10

240

~~1-3/82~~

SURFACE ELEV

AT FT AFTER _____ HOURS

HARRIS W.

300
244140
204

581

GROUND WATER ELEV

[illegible]

GROUND SURFACE TO _____ FT. USED _____" CASING THEN _____" CASING TO _____ FT.

HOLE NO. 4

D DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE : 0-10% LITTLE : 10-20% SOME : 20-35% AND : 35-50%

B-10

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

1st. Taxing District.

CLIENT: Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 4A

CONTRACTOR		PROJECT NO		LINE	
FOREMAN - DRILLER T.B. McN.		PROJECT NAME Grube Dam		STATION	
INSPECTOR		LOCATION New Canaan, Conn.		OFFSET	
GROUND WATER OBSERVATIONS		TYPE		Date Start <u>12/28</u> Date Fin. <u>12/28/63</u>	
AT _____ FT AFTER _____ HOURS		SIZE 10		SURFACE ELEV _____	
AT _____ FT AFTER _____ HOURS		HAMMER WT <u>300</u>		GROUND WATER ELEV _____	
		HAMMER FALL <u>24"</u>		BIT <u>Dia.</u>	

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT							
							0-6	6-12	12-18				
	98											Green brown C-F Sand and gravel; little silt.	
	11												
	14												
	79												
	179												
5	98	1	D	18	14	6'6"	14	19	21				
	75												
	197												
	220												
	440	Refusal									10'0"	Refusal	
10												Bottom Hole 10' 0"	

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT

D DRY W WASHED C CORED P PIT A AUGER U UNDISTURBED PISTON
UB UNDISTURBED BALL CHECK T THINWALL V VANE TEST

PERCENTS USED TRACE : 0-10%, LITTLE : 10-20% SOME : 20-35%, AND : 35-50%

HOLE NO. 4A

B- 11

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT 1st. Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO 4B

CONTRACTOR

PROJECT NO

LINE

FOREMAN - DRILLER

PROJECT NAME

STATION

T.B. M.N.

Grube Dam

INSPECTOR

LOCATION

OFFSET

Nam Canaan, Conn.

GROUND WATER OBSERVATIONS

TYPE

CASING

SAMPLER

CORE BAR

Date Start 12/28 Date Fin. 12/29/64

AT 7'0" FT AFTER 18 HOURS

SIZE 10

WI

SS

DI

SURFACE ELEV _____

AT _____ FT AFTER _____ HOURS

HAMMER WT

300

140

30"

GROUND WATER ELEV -7'

HAMMER FALL

24"

30"

Dia.

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT							
							0-6	6-12	12-18				
	10											Brown C-F Sand, C-F gravel. Some boulders.	
	21												
	17												
	20												
5	22	1	B	18	18	6'6"	12	14	11		Moist Med. Compact		
	50												
	90												
	79												
	50												
10	59	2	D	18	12	11'6"	15	20	27		Moist Compact	10'0"	Grayish C-F Sand, C-F gravel Trace of silt.
	22												
	26												
	30												
	79												
15	82	3	1"	0			150	Refusal				15'0"	Recovered 26" fragmented gray shist. (See wash sample)
20												20'0"	Hole completed at 20'0"
30													
35													
40													

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT

HOLE NO. 4B

D DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20% SOME: 20-35%, AND: 35-50%

B-12

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st. Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO 5

CONTRACTOR

PROJECT NO

LINE

FOREMAN DRILLER
T.B. M.N.

PROJECT NAME
Grupe Dam

STATION

INSPECTOR

LOCATION **New Canaan, Conn**

OFFSET

GROUND WATER OBSERVATIONS

AT _____ FT AFTER _____ HOURS

AT _____ FT AFTER _____ HOURS

TYPE

SIZE 10

HAMMER WT

HAMMER FALL

CASING

SAMPLER

CORE BAR

W

12/10/01

1 3/8

140

30ⁿ

11

1

D

100

Date Start 12/29/62 Date Fin. 12/29/62

SURFACE ELEV

GROUND WATER ELEV

[illegible]

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____" CASING TO _____ FT.

HOLE NO.

D : DRY W : WASHED C : CORED P : PIT A : AUGER UP : UNDISTURBED PISTON

UD UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE 0-0%, LITTLE: 10-20% SOME: 20-35%, AND: 35-50%

B-13

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT 1st. Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 5A

CONTRACTOR

PROJECT NO.

LINE

FOREMAN - DRILLER

PROJECT NAME

STATION

T.B. M.N.

Grupe Dam

INSPECTOR

LOCATION **New Canaan, Conn.**

OFFSET **3' East of 5**

GROUND WATER OBSERVATIONS

TYPE

CASING **WI**

SAMPLER **SS**

CORE BAR **DI**

Date Start **12/29/62** Date Fld. **1/2/63**

AT **5** FT AFTER **16** HOURS

SIZE I.D.

2 1/2"

1 3/8"

SURFACE ELEV.

AT _____ FT AFTER _____ HOURS

HAMMER WT

300

140

B.T.

GROUND WATER ELEV.

HAMMER FALL

24"

30"

Dia.

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6' ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT							
							0-6	6-12	12-18				
	12												
	18												
	10												
	11												
5	20	1	D	18	12	6'6"	23	50	65				
	39												
	60												
	175												
											8'0"		
10													

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT

HOLE NO. **5A**

D DRY W WASHED C CURED P P-IT A AUGER U UNDISTURBED PISTON

UB UNDISTURBED BALL CHECK T T-MINWALL V V-VANE TEST

PROPORTIONS: 10% GRAVEL, 10% LIME, 10% SAND, 20-35% SAND, AND 35-50% SAND

B-14

SOILTESTING, INC. 47 Pershing Drive—Ansonia, Conn.		CLIENT: 1st. Taxing District Norwalk, Conn.		SHEET <u>1</u> OF <u>1</u> HOLE NO. <u>5B</u>	
CONTRACTOR		PROJECT NO		LINE	
FOREMAN - DRILLER T.B. McN.		PROJECT NAME Grupe Dam		STATION	
INSPECTOR		LOCATION New Canaan, Conn		OFF <u>1/4</u> West of #5	
GROUND WATER OBSERVATIONS AT <u>Dry</u> FT AFTER <u>18</u> HOURS AT _____ FT AFTER _____ HOURS		TYPE _____ CASING <u>WI</u> SAMPLER <u>SS</u> CORE BAR <u>DI</u> SIZE I.D. <u>2 1/2"</u> <u>1 3/8"</u> HAMMER WT <u>300</u> <u>140</u> HAMMER FALL <u>24"</u> <u>30"</u> BIT <u>Dia.</u>		Date Start <u>1/2/63</u> Date Fin. <u>1/3/63</u> SURFACE ELEV _____ GROUND WATER ELEV _____	

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY CR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT	0-6	6-12	12-18				
31												Brown C-F Sand, Course gravel and boulders. (Fill)	
20													
36													
54													
55													
5		1	D	12	6"	6'0"	39	129	Refusal		6'0"		
								C	29	Run #1		Drilled 3'0" Boulder	
								C	12				
								C	11				
								C	2				
10								C	3		11'0"	Gr. C-F. Sand, C-Gravel, & boulders	
		2	D	18	8"	13'6"	19	15	39		13'6"		
								C	7	Run #2		Recovered 27" fragmented shist and Quartzite	
								C	2				
								C	5				
								C	3				
15								C	13		18'0"		
20												Bottom of hole 18'0.	
25												Note: Lost some water while coring.	
30													
35													
40													

GROUND SURFACE TO _____ FT.	USED _____ CASING	THEN _____ CASING TO _____ FT	HOLE NO. 5B
O DRY W WASHED C CORED P PIT A AUGER UP UNDISTURBED PISTON UB UNDISTURBED BALL CHECK T THINWALL V VANE TEST			
PROPORTIONS USED GRADE 0-10% LITTLE 10-20% SOME 20-35% AND 35-50%			

CLIENT Norwalk, Conn. PROJECT NO. PROJECT NAME Grupe Dam LOCATION New Canaan, Conn.		HOLE NO. 7 LINE STATION OFFSET	
GROUND WATER OBSERVATIONS AT _____ FT AFTER _____ HOURS AT _____ FT AFTER _____ HOURS		TYPE WI SAMPLER SS CORE BAR D1 SIZE ID 2 1/2" 1 3/8" HAMMER WT 300 140 BIT HAMMER FALL 24" 30" Dia.	
		Date Start 1-4-63 Date Fin. 1-4-63 SURFACE ELEV _____ GROUND WATER ELEV _____	

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT	0-6	6-12	12-18				
	10												Topsoil
	7											2'0"	
									C	13			Suspected Bedrock with intermittent soft layers. Rec. 35" white-gray and brown shist.
									C	5			
									C	4			
5									C	9			
									C	12			
												8'0"	
													Hole completed at 7'0"
10													
15													
20													
25													
30													
35													
40													

GROUND SURFACE TO _____ FT.		USED _____ CASING	THEN _____ CASING TO _____ FT	HOLE NO. 7
D DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST				
PROPORTIONS USED TRACE : 0-10% LITTLE : 10-20% SOME : 20-35% AND : 35-50%				

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO 8A

CONTRACTOR

PROJECT NO

LINE

FOREMAN - DRILLER

PROJECT NAME

STATION

TB MN

Grupe Dam

OFFSET
5' West of #8

INSPECTOR

LOCATION

Date Start 1/4 Date Fin. 1/4/63

GROUND WATER OBSERVATIONS

	WI	SS	DI
TYPE	2 1/2	1 3/8	
SIZE 10	300	140	
HAMMER WT	24"	30"	BIT
HAMMER FALL			Dia

SURFACE ELEV _____
GROUND WATER ~~XXV~~ none

AT _____ FT AFTER _____ HOURS

AT _____ FT AFTER _____ HOURS

HAMMER WT 300 140 BIT
HAMMER FALL 24" 30" Dia

[illegible]

GROUND SURFACE TO _____ FT. USED _____" CASING THEN _____" CASING TO _____ FT.

HOLE NO. 8A

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPERTY HAS USED TRACE = 0-10%, LITTLE = 10-20% SOME = 20-35%, AND = 35-50%

B-20

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 9

CONTRACTOR

PROJECT NO

LINE

FOREMAN — DRILLER

PROJECT NAME

STATION

JD TJ

Grupe Dam

INSPECTOR

LOCATION

OFFSET

New Canaan, Conn.

GROUND WATER OBSERVATIONS

CASING SAMPLER CORE BAR
TYPE WI SS DT
SIZE ID 2 1/2 1 3/8
HAMMER WT 300 140 BIT
HAMMER FALL 24" 30" Dia

Date Start 1/5 Date Fin 1/5/63

AT _____ FT AFTER _____ HOURS

SURFACE ELEV _____

AT _____ FT AFTER _____ HOURS

GROUND WATER ~~ELEV~~ none

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT							
							0-6	6-12	12-18				
	41 75 228 412 395											.6" Topsoil	
5											5'0"		
												Bottom Hole 5'0"	
												Note: Could not keep casing straight will attempt auxiliary hole.	
10													
15													
20													
25													
30													
35													
40													

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ " CASING TO _____ FT

HOLE NO. 9

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
UB: UNDISTURBED BALL CHECK T: THIN WALL V: VANE TEST

PR. P. RT. SWS USED TRACE: 0-10% LITTLE: 10-20% SOME: 20-35% AND: 35-50%

B-21

47 Pershing Drive—Ansonia, Conn.

SHEET 1 OF 1
HOLE NO 9A

CONTRACTOR

PROJECT NO

LINE

FOREMAN - DRILLER

PROJECT NAME

STATION

JD TJ
DIRECTOR

Grupe Dam

OFFSET

LOCATION

~~New Canaan, Conn.~~

5' north of #9

GROUND WATER OBSERVATIONS

AT _____ FT AFTER _____ HOURS

AT _____ FT AFTER _____ HOURS

TYPE

SIZE 10

HAMMER WT

HAMMER FALL

CASINO

VI

2 1/2

300

211

SAMPLER

SS

1 3/8

110

140
205

CORE BAR

DT

3

BUT

D.1

Date Start _____ Date Fin. _____

SURFACE ELEV _____

GROUND WATER ~~EXX~~ none

GROUND SURFACE TO _____ FT. USED _____" CASING THEN _____" CASING TO _____ FT. HOLE NO. 9A

D DRY * WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10%, LITTLE: 10-20% SOME: 20-35%, AND: 35-50%

B-22

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO 11

CONTRACTOR

PROJECT NO

LINE

FOREMAN - DRILLER

PROJECT NAME

STATION

TB	MN
----	----

Grupe Dam

OFFSET

INSPECTOR

LOCATION

New Canaan, Conn.

OFFSET

GROUND WATER OBSERVATIONS

TYPE

CASING

SAMPLER

CORE BAR

Date Start 12/21 Date Fin. 12/22/

AT FT AFTER _____ HOURS

SIZE 10

 $2 \frac{1}{2}$

1 3/8

SURFACE ELEV

AI FT AFTER _____ HOURS

NAME: _____

300

140

017

GROUND WATER EL ~~EX~~ none

HAMMER FALL

24. a

3

Di a

Abstract

GROUND SURFACE TO _____ FT. USED _____" CASING THEN _____" CASING TO _____ FT.

HOLE NO. 11

O: ORY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

UB UNDISTURBED BALL CHECK T: TH NWALL V: VANE TEST

PROPORTIONS: SED. TRACE : 0-10%, LITLLE : 10-20% SOME : 20-35%, AND : 35-50%

B-- 24

SOILTESTING, INC. 47 Pershing Drive—Ansonia, Conn.		CLIENT: <u>1st Taxing District</u> <u>Norwalk, Conn.</u>		SHEET <u>1</u> OF <u>1</u> HOLE NO. <u>11A</u>	
CONTRACTOR FOREMAN — DRILLER JD AJ INSPECTOR		PROJECT NO. PROJECT NAME Grupe Dam LOCATION New Canaan, Conn.		LINE STATION OFFSET 4' east of #11 Date Start <u>12/22</u> Date End <u>12/24/62</u> SURFACE ELEV. _____ GROUND WATER ELEV. _____	
GROUND WATER OBSERVATIONS AT _____ FT AFTER _____ HOURS AT _____ FT AFTER _____ HOURS		TYPE <u>WI</u> SAMPLER <u>SS</u> CORE BAR <u>DT</u> SIZE I.D. <u>2 1/2</u> <u>1 3/8</u> HAMMER WT <u>300</u> <u>140</u> BIT HAMMER FALL <u>24"</u> <u>30"</u> Dia			

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY CR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT	0-6	6-12	12-18				
	76												Boulders & loose fill 4'11" Refusal Bottom Hole 4'11" Note: Casing loose & slanted; cannot core, will attempt auxiliary hole 4' south.
	11												
	53												
	16												
5	390/11"												
10													
15													
20													
25													
30													
35													
40													

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT.

D DRY W WASHED C CORED P PISTON A AUGER U UNDISTURBED P PISTON
 L B ONE STURBED BALL CHECK T TWIN WALL V VANE TEST

PROPORTIONS USED TRACE : 0-10% LITTLE : 10-20% SOME : 20-35% AND : 35-50%

HOLE NO. 11A
 B- 25

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO 11B

CONTRACTOR

PROJECT NO

LINE

FOREMAN - DRILLER

PROJECT NAME

STATION

JD AJ

Grupe Dam

INSPECTOR

LOCATION

OFFSET 4 south of #11

New Canaan, Conn.

GROUND WATER OBSERVATIONS

AT 4'0" FT AFTER 136 HOURS

AT 4'0" FT AFTER 18 HOURS

TYPE

CAS NO

SAMPLER

CORE BAR

SIZE ID

WI

SS

DT

HAMMER WT

2 1/2

1 3/8

BIT

HAMMER FALL

300

140

30"

Date Start 12/24 Date Fin. 12/24

SURFACE ELEV

GROUND WATER ELEV

DEPTH	CASING BLOWS PER FOOT	SAMPLE				DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC		0-6	6-12	12-18				
19													Brn CMT sand coarse gravel and boulders; soft possibly fill
26													
11													
11													
9	1	D	18"	16"	6'6"	10	13	11					
18													8'0"
34													
38													
50													
100	2	D	12"	10"	11'0"	77	100	Refusal					Greyish cmt sand & gravel; some boulders
													11'0"
													Run #1 Bedrock with soft bands of rock Recovered 25" fragmented quartzite gniess & shist
													16'0"
													Bottom Hole 16'0" Note: Low recovery due to soft bands

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT

HOLE NO. 11B

D DRY W WASHED C CORED P PIT A AUGER UP UNDISTURBED PISTON

UB UNDISTURBED BALL CHECK T THINWALL V VANE TEST

PROPORTIONS USED TRACE 0-10%, LITTLE 10-20% SOME 20-35%, AND 35-50%

B-26

SOILTESTING, INC. 47 Pershing Drive—Ansonia, Conn.		CLIENT: <u>Lst Taxing District</u> <u>Norwalk, Conn.</u>		SHEET <u>1</u> OF <u>1</u> HOLE NO. <u>12</u>									
CONTRACTOR		PROJECT NO.		LINE									
FOREMAN -DRILLER TB MN		PROJECT NAME Grupe Dam		STATION									
INSPECTOR		LOCATION New Canaan, Conn.		OFFSET									
GROUND WATER OBSERVATIONS AT _____ FT AFTER _____ HOURS AT _____ FT AFTER _____ HOURS		TYPE <u>WI</u> <u>35</u> <u>DT</u> <u>BAR</u> SIZE I D <u>2 1/2</u> <u>1 3/8</u> HAMMER WT <u>300</u> <u>140</u> BIT HAMMER FALL <u>24"</u> <u>30"</u> Dia		Date Start <u>12/18</u> Date Fin. <u>12/19</u> SURFACE ELEV _____ GROUND WATER ELEV _____									
DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT	0-6	6-12	12-18				
	27												Boulders & loose fill 5'2" Refusal Bottom Hole 5'2" Note: Unable to seat casing to core due to loose fill & boulders. Will attempt auxilary hole 4' eas
	19												
	139												
	27												
	55												
5		1	D	2" 0"	5'2"	100							
10													
15													
20													
25													
30													
35													
40													

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT. HOLE NO. 12
 O DRY W WASHED C CORED P PIT A AUGER UP UNDISTURBED PISTON
 UB UNDISTURBED BALL CHECK T TERNWALL V VANE TEST
 PERCENTS USED TRACE 0-10% LITTLE 10-20% SOME 20-35% AND 35-50%

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 12A

CONTRACTOR

PROJECT NO

LINE

FOREMAN —DRILLER

PROJECT NAME

STATION

TB MN

LOCATION Grupe Dam

INSPECTOR

LOCATION

OFFSET 4' east of #12

New Canaan, Conn.

GROUND WATER OBSERVATIONS

TYPE

CASING

SAMPLER

CORE BAR

Date Start 12/19 Date Fin. 12/20

AT -5 FT AFTER 18 HOURS

SIZE ID

2 1/2

1 3/8

SURFACE ELEV

AT -4 FT AFTER 136 HOURS

HAMMER WT

300

140

BIT

GROUND WATER ELEV -4'

HAMMER FALL

24"

30"

Die

DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC	
		NO	TYPE	PEN	REC	DEPTH @ BOT	0-6	6-12					12-18
	18									1'	Topsoil		
	20										Brn. Cl.F sand coarse gravel		
	110									3'	& boulders (possibly fill)		
	82										Greyish Cl.F sand & gravel		
5	52	1	D	18"	18"	5'6"	29	50	33		little silt(possibly fill)		
	47												
	47												
	25												
	38												
10	60	2	D	12"	9"	11'0"	49	90	Refusal	10'0"			
										11'0"	Same as above		
									C 19	Run #1	Rec. 6"		
									C 5		13'0" Bedrock with soft bands		
									C 30	Run #2			
									C 26		Recovered 36" green granite		
15									C 40				
									C 50				
									C 59		18'0"		
											Bottom Hole 18'0"		
20											Note: Left 1'11" of core		
											down in hole; unable to crack		
											it off. Started to loose		
											water at 13'6"		
25													
30													
35													
40													

GROUND SURFACE TO FT. USED CASING THEN CASING TO FT

HOLE NO. 12A

D DRY W WASHED C CORED P PIT A AUGER U UNDISTURBED PISTON
UB UNDISTURBED BALL CHECK T THINWALL V VANE TEST

PROPORTIONS USED TRACE : 0-10%, LITTLE : 10-20% SOME : 20-35%, AND : 35-50%

B-28

SOILTESTING, INC. 47 Pershing Drive—Ansonia, Conn.		CLIENT: <u>1st Taxing District</u> <u>Norwalk, Conn.</u>		SHEET <u>1</u> OF <u>1</u> HOLE NO. <u>13</u>								
CONTRACTOR		PROJECT NO		LINE								
FOREMAN —DRILLER		PROJECT NAME		STATION								
TB MN		Grupe Dam										
INSPECTOR		LOCATION		OFFSET								
		New Canaan, Conn.										
GROUND WATER OBSERVATIONS AT <u>4'6"</u> FT AFTER <u>18</u> HOURS AT _____ FT AFTER _____ HOURS		TYPE <u>WT</u> <u>SS</u> <u>DT</u> SIZE ID <u>2 1/2</u> <u>1 3/8</u> HAMMER WT <u>300</u> <u>140</u> BIT HAMMER FALL <u>24"</u> <u>30"</u> <u>D12</u>		Date Start <u>1/4</u> Date Fin. <u>1/4/63</u> SURFACE ELEV. _____ GROUND WATER ELEV <u>-4'6"</u>								
DEPTH	CASING BLOWS PER FOOT	SAMPLE				BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT	0-6	6-12				
	39											Brn coarse to med fine sand coarse gravel (possibly fill)
	40											
	20											
	16											
5	19	1	D	18	12	6'6"	21	19	20		5'0"	
	44											10'0" Same as above
	75											
	196											
	84											
	359											
10		2	D	0"	0"	10'0"	100		C 5			15'0" Suspected bedrock Recovered 36" grey-wht granit
									C 13			
									C 14			
									C 19			
									C 23			
15											15'0"	Bottom Hole 15'0"
20												
25												
30												
35												
40												

GROUND SURFACE TO _____ FT, USED _____" CASING THEN _____" CASING TO _____ FT
 D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON
 UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST
 PROPORTIONS USED TRACE: 0-10% LITTLE: 10-20% SOME: 20-35% AND: 35-50%

MOLE NO. 13
 B- 29

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1

HOLE NO. 14

CONTRACTOR		PROJECT NO.	LINE
FOREMAN	DRILLER	PROJECT NAME	STATION
TB	JD	Grupe Dam	
INSPECTOR		LOCATION	OFFSET
		New Canaan, Conn	
GROUND WATER OBSERVATIONS		CASING	SAMPLER
		WI	SS
AT _____ FT AFTER _____ HOURS		TYPE	CORE BAR
		SIZE 10	DT
AT _____ FT AFTER _____ HOURS		HAMMER WT	
		300	
		HAMMER FALL	BIT
		24"	30" Dia
		Date Start <u>1/3</u>	Date Fin. <u>1/3/63</u>
		SURFACE ELEV	
		GROUND WATER ELEV	xx none

DEPTH	CASING BLOWS PER FOOT	SAMPLE				DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC		0-6	6-12	12-18				
	26												
	140												
	210												
	390		Refusal										
5												4'0"	Casing bent at 4'0"
10													
15													
20													
25													
30													
35													
40													

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT

HOLE NO. 14

D DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

UB: UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST

PROPORTIONS USED TRACE: 0-10% LITTLE: 10-20% SOME: 20-35% AND: 35-50%

B-30

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1

HOLE NO 14A

CONTRACTOR

PROJECT NO

LINE

FOREMAN DRILLER
JD AJ

PROJECT NAME

STATION

INSPECTOR

LOCATION

OFFSET 5' north of #14

New Canaan, Conn.

Date Start 1/4 Date Fin. 1/4/63

GROUND WATER OBSERVATIONS

TYPE

CASING

SAMPLER

CORE BAR

AT -9' FT AFTER 18 HOURS

SIZE 10

WI

SS

DT

SURFACE ELEV

AT FT AFTER HOURS

HAMMER WT

300

140

BIT

GROUND WATER ELEV -9'

HAMMER FALL

24"

30"

Dia

DEPTH	CASING BLOWS PER FOOT	SAMPLE				DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FOR 6" ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC		0-6	6-12	12-18				
30													6" Topsoil
162													
289													
365													
581													
5	440	1	D	0"	0"		100/0"	C		4			Refusal on casing at 5' Run #1 6" recovery - Boulders See wash sample
	365							C		2			
	429							C		1			
	510							C		2			
	568							C		3			
10		2	D	0"	0"		100/0"	C		3			10' Run #2 Lost most of wash water when coring Recovered 30" grey shist & white granite
								C		5			
								C		5			
								C		6			
								C		6			
15													15' Bottom Hole 15'
20													
35													
0													
35													

GROUND SURFACE TO FT. USED CASING THEN CASING TO FT

HOLE NO 14A

D DRY W WASHED C CORED P PIT A AUGER U UNDISTURBED PISTON
UB UNDISTURBED BALL CHECK T T H WALL V VANE TEST

PROB. % NS. SEC. SHALE 10-20% L. F. 0-20% SOME 20-35% AND 35-50%

B-31

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO. 15

CONTRACTOR

PROJECT NO

LINE

FOREMAN - DRILLER

PROJECT NAME

STATION

JD AJ

Grupe Dam

INSPECTOR

LOCATION

OFFSET

New Canaan, Conn.

GROUND WATER OBSERVATIONS

CASING TYPE WI SAMPLER SS CORE BAR DT
SIZE ID 2 1/2 1 3/8
HAMMER WT 300 140 BIT
HAMMER FALL 24" 30" Dia

Date Start 12/28 Date Fin. 12/28/62

SURFACE ELEV

GROUND WATER ELEV XX none

DEPTH	CASING BLOWS PER FOOT	SAMPLE				DEPTH @ BOT	BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC								
							0-6	6-12	12-18				
	90 125 350/6"					Refusal							Casing Bent 2'6" Refusal
5													Bottom Hole 2'6"
10													
15													
20													
25													
30													
35													
40													

GROUND SURFACE TO _____ FT. USED _____ CASING THEN _____ CASING TO _____ FT

HOLE NO. 15

0 DRY W WASHED C CORED P: PIT A: AUGER U: UNDISTURBED PISTON
C: UNDISTURBED BALL CHECK T: TWIN WALL V: VANE TEST

PERCENTAGE USED GRADE 0-10% 11-20% 21-30% 31-40% 41-50% 51-60% 61-70% 71-80% 81-90% 91-100%

B- 32

SOILTESTING, INC.

47 Pershing Drive--Ansonia, Conn.

CLIENT 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO 15A

CONTRACTOR

PROJECT NO

LINE

FOREMAN DRILLER

PROJECT NAME

STATION

JD AJ

Grupe Dam

INSPECTOR

LOCATION

OFFSET

New Canaan, Conn.

5' north of #15

GROUND WATER OBSERVATIONS

TYPE

CASING

SAMPLER

CORE BAR

Date Start 12/28 Date Fin. 12/28

AT FT AFTER HOURS

SIZE 10

2 1/2

1 3/8

SURFACE ELEV

AT FT AFTER HOURS

HAMMER WT

300

140

BIT

GROUND WATER xxv none

HAMMER FALL

24"

30"

Dia

CASING
BLOW
PER
FOOT

SAMPLE
NO TYPE PEN REC DEPTH
@ BOT

BLOWS PER 6
ON SAMPLER
(FOR 1 ON TUBE)

CORING
TIME
PER FT
(MIN)

DENSITY
OR
CONSIST

STRATA
CHANGE
DEPTH

FIELD IDENTIFICATION OF SOIL
REMARKS INCL COLOR, LOSS OF
WASH WATER, SEAMS IN ROCK, ETC

100
307
410

Refusal

3'0"

Refusal

Bottom Hole 3'0"

GROUND SURFACE TO _____ FT USED _____ CASING THEN _____ CASING TO _____ FT

HOLE NO. 15A

DRY WASHED COLORED P. PIT AUGER UP UNDISTURBED PISTON
UB UNDISTURBED BALL BEAT T. TH WALL V. VANE TEST

PERCENT MOISTURE THALE 0-10% 10-20% 20-35% 35-50% 50-60% 60-75% 75-90% 90-100%

B-33

SOILTESTING, INC. 47 Pershing Drive—Ansonia, Conn.		CLIENT: <u>1st Taxing District</u> <u>Norwalk, Conn.</u>			SHEET <u>1</u> OF <u>1</u> HOLE NO. <u>15B</u>	
CONTRACTOR		PROJECT NO.			LINE	
FOREMAN - DRILLER		PROJECT NAME			STATION	
JD AJ		Grupe Dam				
INSPECTOR		LOCATION			OFFSET	
		New Canaan, Conn.			10' east of #15	
GROUND WATER OBSERVATIONS AT _____ FT AFTER _____ HOURS AT _____ FT AFTER _____ HOURS		TYPE		CASING	SAMPLER	CORE BAR
		SIZE ID		WI	SS	DT
		HAMMER WT		300	140	BIT
		HAMMER FALL		24"	30"	Dia
		Date Start		Date Fin		
		12/29		12/29		
		SURFACE ELEV				
		GROUND WATER ELEV		xx		none

DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	DEPTH @ BOT	0-6	6-12	12-18				
75													
210													
375													
380													
310													
5		1	D	0"	0"	100/0"						5'0"	Casing bent lost shoe Refusal
						Refusal							Bottom Hole 5'0"
10													
15													
20													
25													
30													
35													
40													

GROUND SURFACE TO _____ FT,		USED _____ CASING		THEN _____ CASING TO _____ FT		HOLE NO. 15B
D DRY	W WASHED	C CORED	P PIST	A AUGER	UP UNDISTURBED PISTON	
UB UNDISTURBED BALL CHECK		T THINWALL		V VANE TEST		
PROPERTIES: SET _____ TRACE _____ 0% _____ 10-20% _____ SOME 20-35% AND 3. 50%						

47 Pershing Drive—Ansonia, Conn.

CLIENT 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO 15C

CONTRACTOR

PROJECT NO.

LINE

FOREMAN DRILLER

PROJECT NAME

STATION

JD AJ

Grupe Dam

INSPECTOR

LOCATION

OFFSET

New Canaan, Conn.

24' East of #15

GROUND WATER OBSERVATIONS

TYPE

CASING

SAMPLE

REF BAR

SIZE 10

2 172

1 3/8

HAMMER WT

30

8.1

HAMMER FALL

24"

30"

Dia.

Date Start 12/29 Date Fin 1/3/63

SURFACE ELEV

GROUND WATER ELEV ^{XX} none

[illegible]

GROUND SURFACE TO _____ FT. USED _____" CASING THEN _____" CASING TO _____ FT.

HOLE NO. 15C

D: DRY W: WASHED C: CORED P: PIT A: AUGER UP: UNDISTURBED PISTON

LD UNO STORED BALL CHECK TITH WALL VIVANE TEST

PALEOPOLYMER: 10% TO 20% OF POLYMER; 10% TO 20% SOME: 20-35%, AND: 35-50%

B-35

SOILTESTING, INC.

47 Pershing Drive—Ansonia, Conn.

CLIENT: 1st Taxing District
Norwalk, Conn.

SHEET 1 OF 1
HOLE NO 16

CONTRACTOR

PROJECT NO

LINE

FOREMAN - DRILLER

PROJECT NAME

STATION

JD AJ

Grupe Dam

INSPECTOR

LOCATION

OFFSET

New Canaan, Conn.

GROUND WATER OBSERVATIONS

TYPE

CASING

SAMPLER

CORE BAR

Date Start 12/27 Date Fin. 12/21

AT FT AFTER HOURS

SIZE ID

2 1/2

1 3/8

SURFACE ELEV

AT FT AFTER HOURS

HAMMER WT

300

140

BIT

GROUND WATER ~~EX~~ none

HAMMER FALL

24"

30"

Dia

DEPTH @ BOT	CASING BLWS PLN FOOT	SAMPLE				BLWS PER 6" ON SAMPLER (FORCE ON TUBE)			CORING TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC
		NO	TYPE	PEN	REC	0-6	6-12	12-18				
	24											Topsoil 6" Brn C-F sand; some gravel trace of silt
	80											
	390		Refusal						C 1	Run #1	3'	
	410								C 1			
5	580										5'	
	65	1	D	18"	16"	6'6"	23	28	29			
	168											
	410		Refusal								7'	
	225									Run #2		
	144										9'	
10	80	2	D	6"	7"	11'6"	145					Recovered 36" fragmented grey granite
	185											
	100											
	58											
15	605	3	D	0"	0"	15'0"	100				15'	
			Refusal						C 4	Run #3		
									C 4			
									C 5			
									C 5			
20									C 6		20'	
												Bottom Hole 20'0"

GROUND SURFACE TO FT. USED CASING THEN CASING TO FT

HOLE NO. 16

D DRY W WASHED C CORED P PIST A AUGER U UNDISTURBED PISTON
LB UNDISTURBED WALL CHECK WITH WALL V VANE TEST

PH. POINTS USED GRAVE 31.0% LIME 1.0% SCHE 1.20-35%, AND 1.35-50%

No. NCN 21

WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

Long. 73° 21.3' 3
Lat. 41° 11.3' CT 57

Inventoried
By WPS

Date 15 APRIL 1965

Name of Dam or Pond GRUPES RESERVOIR

Code No. NW 3.5 SL 6.5

Nearest Street Location VALLEY ROAD

Town NEW CANAAN

U.S.G.S. Quad. NORWALK NORTH

Name of Stream SILVERMINE RIVER

Owner FIRST DISTRICT WATER DEPARTMENT

Address 3 BELDEN AVENUE

NORWALK

? 1871

Pond Used For WATER SUPPLY DA 10.25M

Dimensions of Pond: Width 200 FEET Length 3300 FEET Area 22.0 ACRES

Total Length of Dam 200 FEET Length of Spillway 25 FEET

Location of Spillway EAST END OF DAM

Height of Pond Above Stream Bed 30 FEET

Height of Embankment Above Spillway 5 FEET

Type of Spillway Construction CONCRETE CAP

Type of Dike Construction MASONRY

Downstream Conditions WOODS ROADS

Summary of File Data

Remarks

Would Failure Cause Damage? YES Class B

24 Maple Ave.
Bloomfield, Conn. 06002
June 27, 1972

Dr. Joe Webb Peoples, Director
Connecticut Geological and Natural History Survey
Wesleyan Station
Middletown, Conn. 06457

Dear Dr. Peoples:

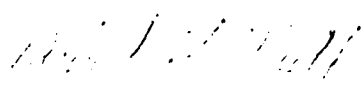
I would like to call to your attention a potentially hazardous situation concerning the bedrock geology in the Norwalk North quadrangle.

The dam at Grupes Reservoir, near the western edge of the quadrangle, is located on calc-silicate gneiss. This rock contains calcite and surface exposures directly below the dam exhibit considerable solution of several layers.

If similar solution is occurring in the subsurface and if the dam is anchored to these rocks, then the dam foundation may have weakened.

I would appreciate knowing whether or not this condition has been monitored by the appropriate agency.

Sincerely yours,


Richard L. Kroll

WATER & RELATED
RESOURCES
RECEIVED

AUG 5 1972

ANSWERED _____
FORWARDED _____
FILED _____

ROALD HAESTAD, INC.
CONSULTING ENGINEERS

751 West Main Street • Waterbury, Conn. 06708 • Tel. 203 755-2254

MEMORANDUM

DATE: September 5, 1972

TO: File 016-01-10

Page 1 of 2

Grupes Reservoir Dam, New Canaan, Conn.

FROM: RJH

SUBJECT: Investigation

REFERENCES:

Grupes Reservoir Dam

Owner: Norwalk Second District
Norwalk, Connecticut

General Manager: Mr. Nick Bredice

Borings: Soiltesting, Inc.
Seymour, Connecticut

Consultants:

The Henry Souther Engineering Company
Roderick Hewitt
Frederick Almquist

Buck, Seiffert and Jost

Connecticut Geological and Natural History Survey

Dr. Joseph Webb Peoples, Director
Dr. Richard L. Kroll
Newark State College
Union, New Jersey Phone: 201-527-2257

**WATER & RELATED
RESOURCES
RECEIVED**

SEP 11 1972

ANSWERED _____

DEFERRED _____

FILED _____

ROALD HAESTAD, INC.

MEMO: September 5, 1972
Grupes Reservoir Dam
Page 2 of 2

COMMENTS:

Had a call from O'Brian, they do not have any information on the Grupes Dam.

I called Dr. Peoples. Dr. Kroll was summer help-with mapping the geology of Connecticut. Dr. Peoples would like to have the copies of borings at Mill River and Trinity Dams and also the report that Dr. Matt Walton made on Mill River. I will try and get hold of this for him.

I called Dr. Kroll, he told me of surface deterioration of the rock near Grupes Dam, but doesn't know how long this has taken place. He will send me some of the data he has.

I then called Norwalk Water Company, second district and spoke with the General Manager, Mr. Nick Bredice. He said that they were using Henry Souther in Hartford as their Consultant, and that they had sent copies of their borings to them. Apparently borings were done in 1962 at the dam.

I called Henry Souther and spoke with Mr. Hewitt. They are gathering information on the dam for DEP. He thought the dam might be 100 years old. Thought the Consultant for the dam at that time was Buck, Seiffert and Jost, and they have contacted them for drawings they may have. I said that I would not double up, but wait until they had the information available for the DEP.

I made a tentative appointment with Mr Bredice of the Norwalk Water Company, for Friday at 9:00, September 8.

Have received U.S.G.S. maps of the area - in the mail today.

RJH: 2 hours

cc: William H. O'Brian, III ✓
Civil Engineer
DEP

WATER & RELATED
RESOURCES
RECEIVED

SEP - 8 1972

ANSWERED _____
REFERRED _____
FILED _____

ROALD HAESTAD, INC.
CONSULTING ENGINEERS

751 West Main Street • Waterbury, Conn. 06708 • Tel. 203 755-2254

September 14, 1972

State of Connecticut
Department of Environmental Protection
Water and Related Resources
State Office Building
Hartford, Connecticut 06115

Attention: Mr. William H. O'Brian, III
Civil Engineer

Dear Mr. O'Brian:

On Friday, September 8, 1972, Mr. Nick Bredice,
General Manager of the Norwalk Water Company, First District,
and I, inspected the Grupes Reservoir Dam in New Canaan,
Connecticut.


The overall condition of the dam indicates that
there is no immediate problem, or danger of failure.

We will send in our report as soon as we receive
all the supplemental data.

Very truly yours,

ROALD HAESTAD, INC.

By



Roald Haestad

RH:jh

**WATER & RELATED
RESOURCES
RECEIVED**

SEP 18 1972

ANSWERED _____

REFERRED _____

FILED _____

APPENDIX C

DETAIL PHOTOGRAPHS

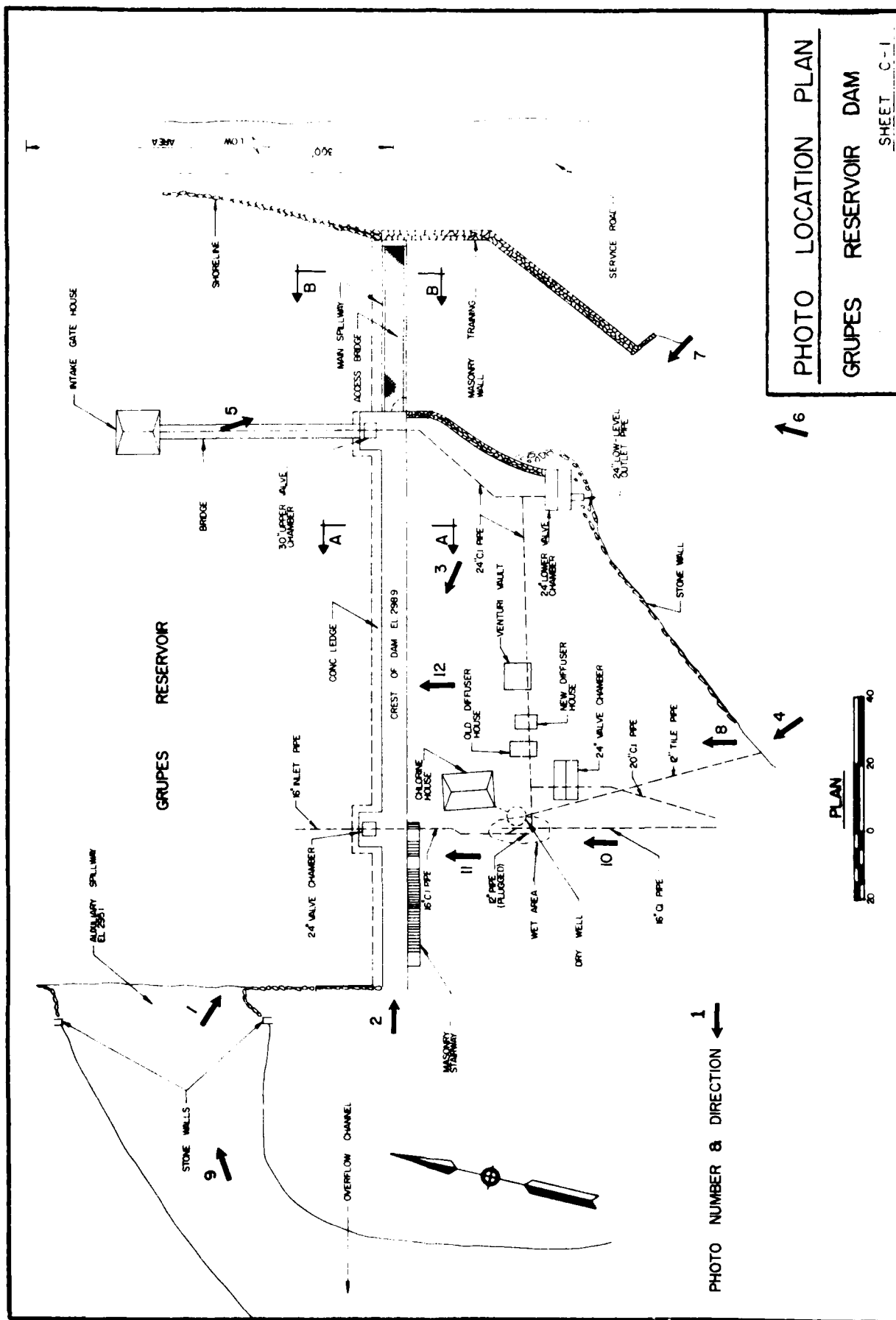




Photo 1 - Upstream slope and emergency intake valve chamber.
(Nov. 1979)



Photo 2 - Crest of dam and gatehouse (Nov. 1979)

US ARMY ENGINEER DIV. NEW ENGLAND
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WALTHAM, MASS.

CAHN ENGINEERS INC.
WALLINGFORD, CONN.
ENGINEER

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Grupes Reservoir Dam
Silvermine River

New Canaan, Connecticut

CE #27 660 KE

DATE Dec '79 PAGE C-1

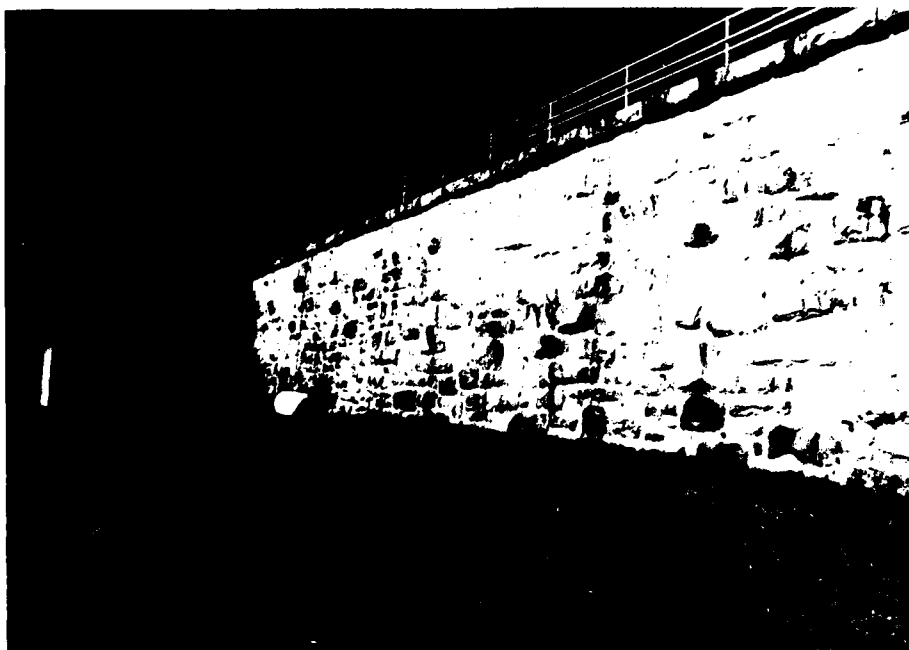


Photo 3 - Downstream slope of dam (Nov. 1979)



Photo 4 - Outlet for 12 inch pipe to drywell (Nov. 1979)

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NON-FED. DAMS

Grupe Reservoir Dam
Silvermine River
New Canaan, Connecticut
CE #27 660 KE
DATE Nov '79 PAGE C-2



Photo 5 - Spillway from upstream (Nov. 1979)



Photo 6 - Spillway from downstream. (Nov. 1979)

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NON-FED. DAMS

Grupes Reservoir Dam
Silvermine River
New Canaan, Connecticut
CE# 27 660 KE
DATE Dec '79 PAGE C-3



Photo 7 - Valve chamber and outlet for 24 inch low-level outlet
(Nov. 1979)



Photo 8 - Brick Chlorine house, valve chamber for 20 inch
supply line, and diffuser house on right. (Nov. 1979)

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NATIONAL PROGRAM OF
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NON-FED. DAMS

Grupes Reservoir Dam
Silvermine River
New Canaan, Connecticut

CE# 27 660 KE

DATE Dec 1979 PAGE C-4



Photo 9 - Auxiliary spillway from downstream (Nov. 1979)



Photo 10 - Wet area near chlorine house and drywell. (Nov. 1979)

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NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Grupes Reservoir Dam

Silvermine River

New Canaan, Connecticut

CE # 27 660 KE

DATE Nov '79 PAGE C-5

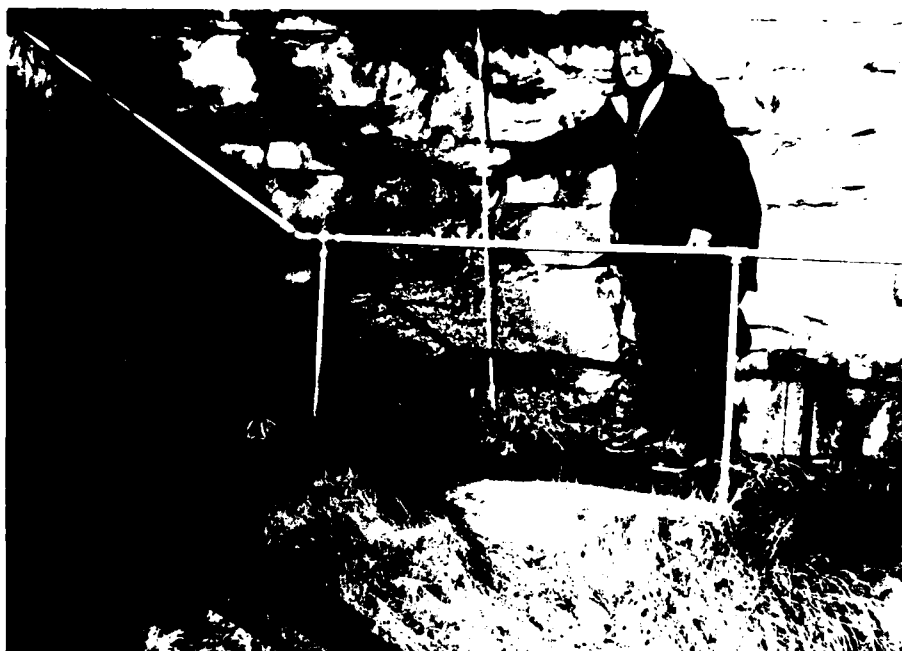


Photo 11- seepage near stairway at right downstream side of dam. (Dec. 1979).

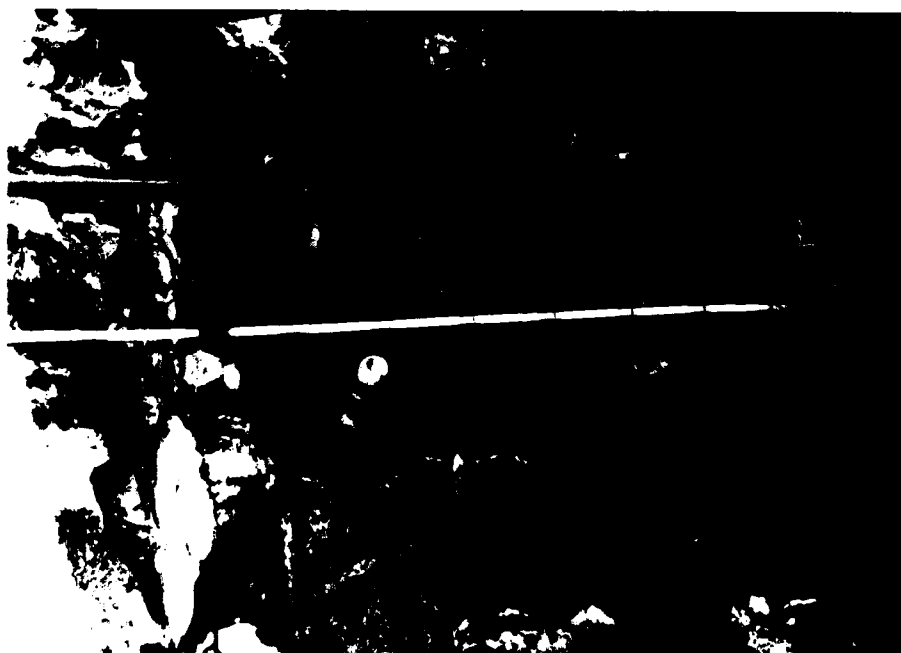


Photo 12 - Seepage at central downstream side of dam. Note grouting pipe. (Dec. 79)

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NATIONAL PROGRAM OF
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NON-FED. DAMS

Grupes Reservoir Dam
Silvermine River

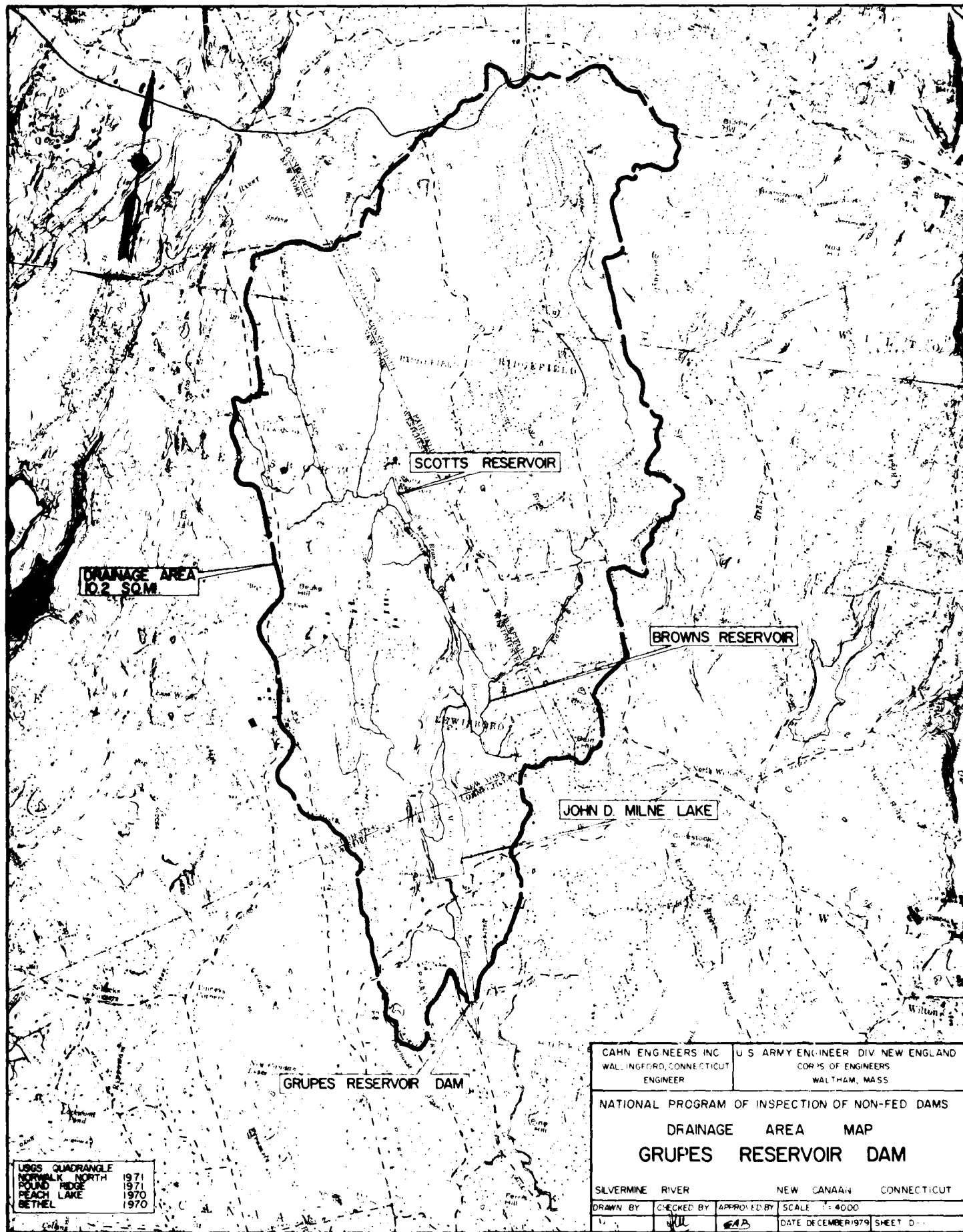
New Canaan, Connecticut

CE# 27 660 KE

LATE Nov '79 PAGE C-6

APPENDIX D

HYDRAULIC/HYDROLOGIC COMPUTATIONS



AD-A142 686 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
GRUPES RESERVOIR DAM (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV DEC 79

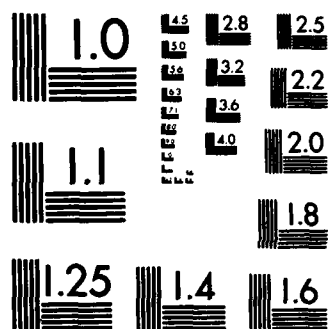
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
GRUPES RESERVOIR DAM (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV DEC 79

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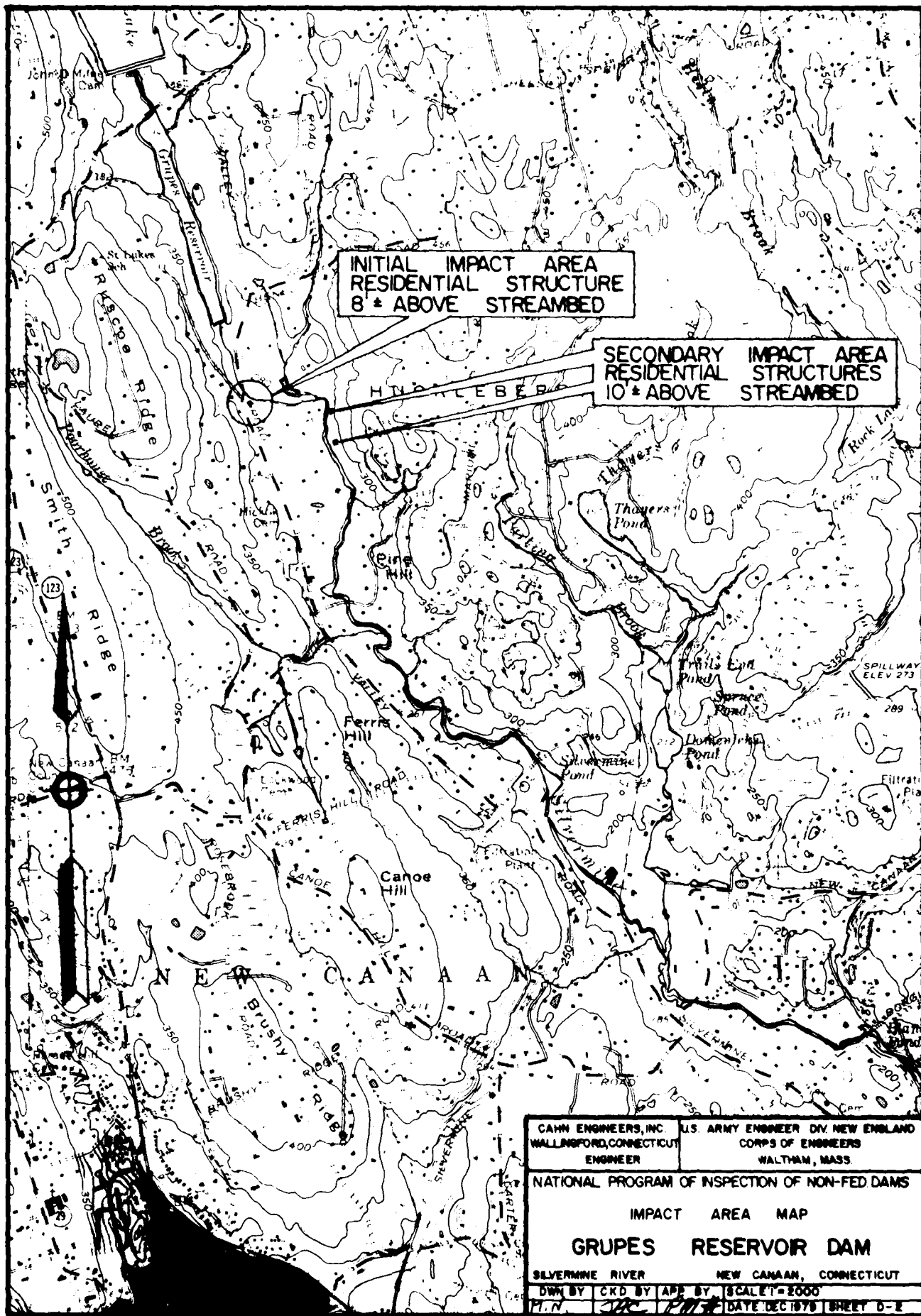
UNCLASSIFIED F/G 13/13 NL

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NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



CAHN ENGINEERS, INC. WALLINGFORD, CONNECTICUT ENGINEER		U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS			
IMPACT AREA MAP			
GRUPES RESERVOIR DAM			
SILVERMINE RIVER		NEW CANAAN, CONNECTICUT	
OWN BY	CKD BY	APP BY	SCALE 1" = 2000'
P.N.	JRC	PM	DATE DEC 1978 SHEET 0-2

Project INSPECTION OF NON-FEDERAL DAMS IN NEW ENGLAND Sheet D-1 of 17
 Computed By HOL Checked By SGB Date 11/16/79
 Field Book Ref _____ Other Refs CE #27-660-HE Revisions _____

HYDROLOGIC/HYDRAULIC INSPECTION

GRUPES RESERVOIR DAM, NEW CANAAN, CT.

I) PERFORMANCE AT PEAK FLOOD CONDITIONS:

1) PROBABLE MAXIMUM FLOOD (PMF):

a) WATERSHED CLASSIFIED AS "ROLLING"

b) WATERSHED AREA (D.A.):

THE GRUPES RESERVOIR IS THE FURTHEST $\frac{1}{4}$ OF A SERIES OF FOUR RESERVOIRS REGULATING THE SILVERMINE RIVER FOR WATER SUPPLY PURPOSES. THE TOTAL WATERSHED IS IDENTIFIED AS FOLLOWS*:

- | | |
|---|---|
| c) D.A. TO SCOTTS RESERVOIR: | (DA) _s = 1.9 ^{sq mi.} |
| ii) INCREMENTAL D.A. TO BROWNS RES.: $\Delta_{s,b} = 5.5$ ^{sq mi.} | |
| iii) D.A. TO BROWNS RESERVOIR: | (DA) _b = 7.4 ^{sq mi.} |
| iv) INCREM. D.A. TO J.D. MILNE LAKE: $\Delta_{b,m} = 1.9$ ^{sq mi.} | |
| v) D.A. TO JOHN D. MILNE LAKE: | (DA) _m = 9.3 ^{sq mi.} |
| vi) INCREM. D.A. TO GRUPES RES.: $\Delta_{m,g} = 0.9$ ^{sq mi.} | |
| vii) TOTAL D.A. TO GRUPES RESERVOIR: | D.A. = (DA) _g = 10.2 ^{sq mi.} |

c) PEAK FLOODS (FROM NED-ACE GUIDELINES - GUIDE CURVES FOR PMF):

ALTHOUGH THE RESERVOIRS $\frac{1}{4}$ FROM GRUPES REGULATE (?) 91% OF THIS RESERVOIR WATERSHED, THEIR SURCHARGE STORAGE EFFECT

*NOTE: DRAINAGE AREAS FROM CONN. DEP. BULLETIN No. 1, 1972 (GAZETTEER OF NATURAL DRAINAGE AREAS) p. 70 AND C.E. MEASURE ON USGS NORWALK NORTH, CT.; BETHEL, CT.; PEACH LAKE, NY-CT; AND, POUND RIDGE, NY-CT. QUADRANGLE SHEETS.

Project NON-FEDERAL DAMS INSPECTION

Sheet D-2 of 17

Computed By HLL

Checked By CRB

Date 11/16/77

Field Book Ref. _____

Other Refs. CE# 27-660-HB

Revisions _____

GRUPES RESERVOIR DAM

1. C - (C.O.H.) PEAK FLOODS

ON PEAK FLOOD REDUCTION IS NEGLIGIBLE BECAUSE OF THEIR "NORMALLY FULL RESERVOIR" STATUS AND THEIR RELATIVELY SMALL SURFACE AREA WHICH TOTALS ONLY (±) 130 AC OR (±) 2% OF THE WATERSHED.

THEREFORE, PEAK FLOODS AT GRUPES RESERVOIR WILL BE ESTIMATED BASED ON THE PEAK FLOW RATE FOR THE ENTIRE WATERSHED.

$$i) PMF \approx 1600 \text{ cfs/sq mi} \times 10.2 \approx \underline{16300 \text{ cfs}}$$

$$ii) \frac{1}{2} PMF \approx 8150 \text{ cfs}$$

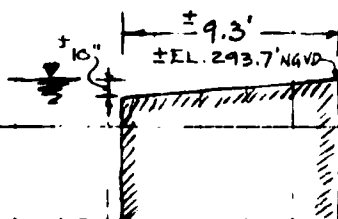
2) SURCHARGE AT PEAK INFLOWS (PMF AND $\frac{1}{2}$ PMF)

a) OUTFLOW RATING CURVE

c) SPILLWAYS:

GRUPES RESERVOIR DAM HAS TWO SPILLWAYS. THE PRINCIPAL SPILLWAY, TO THE LEFT OF THE DAM, IS A STONE MASONRY TRAPEZOIDAL WEIR WITH VERTICAL $\frac{1}{2}$ AND $\frac{3}{4}$ FACES AND CREST SLOPING UPWARD TOWARDS THE $\frac{3}{4}$ FACE AT (±) 11" TO 1". THE $\frac{3}{4}$ EDGE OF THE CREST (FLOW LINE) IS AT (±) ELEV. 293.7' NGVD. (SEE SKETCH BELOW).

IN PLAN, THE SPILLWAY LENGTH BELOW (±) ELEV. 295.1' NGVD



NOTE: DATA FROM C.E. FIELD OBSERVATIONS AND AVAILABLE DWGS. FURNISHED BY THE NORMAN 1ST TAXING DISTRICT WATER CO.

*ELEVATIONS AS SHOWN ON THE NORM. 1ST TAXING DISTRICT WATER CO. "GRUPES DAM SURVEY" SCALE 1"=20' ARE ASSUMED TO BE MSL OR, NATIONAL GEODETIC VERTICAL DATUM (NGVD).

Project NON FEDERAL DAMS INSPECTION

Sheet D-3 of 17

Computed By HL

Checked By CE

Date 11/10/77

Field Book Ref. _____

Other Refs CE # 37-660-HK

Revisions _____

IRUPES RESERVOIR DAM

2.2 - (Cont'd) OUTFALL RATING CURVE - SPILLWAYS

IS ONLY $L_1 = 44.6'$ BECAUSE THERE IS A $(+)$ 1.4' HIGH SILL AT THE RIGHT END OF THE SPILLWAY WHICH KEEPS THE FALLING WATER AWAY FROM THE CHANNEL SIDEWALL BELOW. ABOVE ELEV. 295.1' NGVD, THE SPILLWAY LENGTH IS $L_2 = 48.9'$. THE HEIGHT BETWEEN THE SPILLWAY CREST AND THE TOP OF THE DAM IS $H = 5.2'$. THE SPILLWAY IS SPANNED BY A STEEL FOOT BRIDGE WITH LOW CHORD AT $(+)$ ELEV. 299.4' NGVD $(+6"$ ABOVE THE TOP OF THE DAM) AND $(+)$ 2" SEC. GIRDERS $(+)$ 1' HIGH $(+)$ TOP ELEV. 300.4' NGVD.

AN UNLINED CHANNEL TO THE RIGHT OF THE DAM (WEST SIDE), $(+)$ 60' WIDE WITH A BOTTOM ELEV. 295.1' NGVD $(+)$ 1.4' ABOVE THE PRINCIPAL SPILLWAY CREST) SERVES AS AN AUXILIARY SPILLWAY. THE ORIGINAL SILL BETWEEN TWO EXISTING $(+)$ 5' HIGH SIDE WALLS ON THE CHANNEL HAS BEEN DESTROYED (SEE NORMAN 1ST TOWN DISTRICT WATER CO. "GROVE DAM SURVEY" MAP).

ASSUMING $C = 3.1$ FOR THE PRINCIPAL SPILLWAY AND $C = 2.7$ FOR THE AUXILIARY SPILLWAY AND USING THE CREST ELEVATION OF THE PRINCIPAL SPILLWAY AS DATUM (ELEV. 293.7' NGVD), THEIR DISCHARGE IS APPROXIMATED BY (SEE SKETCH P. D-5):

1) PRINCIPAL SPILLWAY

$$(Q_1) = 3.1 \times 44.6 H^{3/2} + 3.1 \times 4.3 (H - 1.4)^{3/2} = 145 H^{3/2} + 13 (H - 1.4)^{3/2}$$

($H = 5.7'$ OR LOW CHORD OF FOOT BRIDGE)

2) AUXILIARY SPILLWAY

$$(Q_2) = 2.7 \times 60 (H - 1.4)^{3/2} = 160 (H - 1.4)^{3/2}$$

THEREFORE, THE COMBINED DISCHARGE OF THE SPILLWAYS CAN BE

Project VON-FEDERAL DAMS INSPECTION

Sheet 2 of 17

Computed By Hell

Checked By AS

Date 11/1/14

Field Book Ref _____

Other Refs. CE # 27-660-HB

Revisions _____

GRUPES RESERVOIR DAM

2.9 (Cont'd) OUTFLOW RATING CURVE - SPILLWAYS

APPROXIMATED (TO THE LOW CHORD OF THE FOOT BRIDGE) BY

$$Q_s' = 140H^{3/2} + 170(H-1.4)^{3/2} \quad (H \leq 5.7')$$

BECAUSE OF THE FOOT BRIDGE, THE PRINCIPAL SPILLWAY WILL HAVE ORIFICE FLOW AND THE DISCHARGE OF THE SPILLWAYS ABOVE (+) ELEV 294.4' NAVD, FOR LEVELS $5.7' < H \leq 6.7'$ IS APPROXIMATED BY:

$$Q_s'' = (Q_s')_1 + (Q_s')_2 ; (Q_s')_1 = CA\sqrt{2gH_1} = 1200(H-2.9)^{1/2} \\ (C=0.55 \quad A=270 \quad H_1=H-2.1)$$

$$(Q_s')_2 = 160(H-1.4)^{3/2}$$

$$Q_s'' = 1200(H-2.9)^{1/2} + 160(H-1.4)^{3/2} \quad (5.7' < H \leq 6.7')$$

FOR SURCHARGES: $H > 6.7'$, THE PRINCIPAL SPILLWAY (ORIFICE) FLOW WILL BE COMBINED WITH THE WEIR FLOW OVER THE FOOT BRIDGE GIRDERS AND THE OVERFLOW EQUATION FOR THE SPILLWAY IS APPROXIMATED:

$$Q_s''' = Q_s'' + (Q_s)''' ; (Q_s)''' = 2.7 \times 52(H-6.7)^{3/2} = 140(H-6.7)^{3/2} \\ (\text{FOR THE GIRDERS: } C=3.7 \text{ AND } L=52')$$

$$\therefore Q_s''' = 1200(H-2.9)^{1/2} + 140(H-6.7)^{3/2} + 160(H-1.4)^{3/2} \quad (H > 6.7')$$

(4) EXTENSION OF THE RATING CURVE FOR SURCHARGES SURROUNDING THE DAM AND/OR ADJACENT TERRAIN.

GRUPES RES. DAM IS A STONE MASONRY DAM WITH A TOP ELEVATION OF (+) 298.9' NAVD. THE DAM AND ADJACENT TERRAIN REMAIN AT THIS ELEVATION FOR A TOTAL LENGTH OF (+) $L=190'$. THE WIDTH OF THIS

Project NON-FEDERAL DAMS INSPECTION Sheet D-5 of 17
 Computed By HLL Checked By L.R.B. Date 11/19/79
 Field Book Ref _____ Other Refs CE # 27-660-HB Revisions _____

GRUPES RESERVOIR DAM

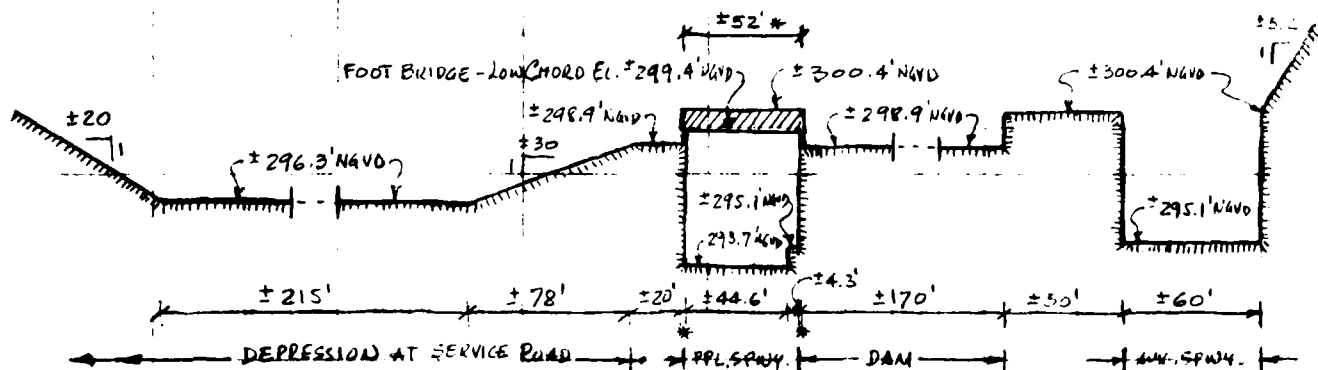
2, a - (Cont'd) OUTFLOW RATING CURVE

PORTION OF THE OVERFLOW PROFILE CAN BE CONSIDERED, IN GENERAL, THE PREVAILING TOP WIDTH OF THE DAM, (±) 7'.

TO THE LEFT OF THE PRINCIPAL SPILLWAY THE DAM TIES PERMANENTLY TO THE SERVICE ROAD WHICH RUNS PARALLEL TO THE LEFT (EAST) SHORE OF THE RESERVOIR. THE ROAD FORMS A DEPRESSION (±) 315' LONG, AT (±) ELEV. 296.3' NGVD, WITH 30" TO 1" (RIGHT) AND 20" TO 1" (LEFT) SIDE SLOPES. THIS DEPRESSION OVERFLOWS INTO A LOW AREA WHICH APPARENTLY DRAINS TO SILVERMINE RIVER ½ FROM GRUPES DAM. OVERFLOW THROUGH THIS DEPRESSION WILL BE ASSUMED TO OCCUR ABOVE ELEV. 296.3' NGVD, ALTHOUGH A 4' STONE WALL (±) 1.7' HIGHER, BORDERS THE ROAD AT BOTH SIDES. (SEE OVERFLOW PROFILE SKETCH BELOW).

BETWEEN THE DAM AND THE AUXILIARY SPILLWAY, THE NATURAL TERRAIN WHICH FORMS AN OVERFLOW PROFILE (±) 50' LONG WILL BE ASSUMED FOR SIMPLIFICATION AT (±) ELEV. 300.4' NGVD.

THE TERRAIN BEYOND THE RIGHT-SIDE WALL OF THE AUXILIARY SPILLWAY, (TOP ELEV. (±) 300.4' NGVD) SLOPES UPWARD AT (±) 52" TO 1".



GRUPES RESERVOIR DAM — OVERFLOW PROFILE

*NOTE: BRIDGE OVERLAPS ABUTMENT

Project NON-FEDERAL DAMS INSPECTION

Sheet D-6 of 11

Computed By HLL

Checked By ASB

Date 11/17/79

Field Book Ref

Other Refs. CE #27-660-HB

Revisions

GRUPES RESERVOIR DAM

2.2 Cmt'd) OVERFLOW RATING CURVE

THEFORE, ASSUMING $C=2.7$ FOR THE OVERFLOW AT ALL OVERTOPPING POINTS AND AN EQUIVALENT LENGTH FOR THE SLOPING TERRAIN, THE OVERFLOW CAN BE APPROXIMATED BY THE FOLLOWING EQUATIONS:

1') SLOPING TERRAIN TO THE RIGHT OF THE AUX. SPUR:

$$L'_{R,S} = \frac{2}{3}(5.2)(H-6.7) \quad \therefore Q'_{R,S} = \frac{9.4(H-6.7)^{5/2}}{\sim 3.47}$$

2') TERRAIN BETWEEN DAM AND AUX. SPUR (+EL. 300.4' MVD):

$$Q_{D,S} = 2.7 \times 50 (H-6.7)^{3/2} = 140 (H-6.7)^{3/2}$$

3') TOP OF DAM AND TERRAIN AT (+) EL. 298.9' MVD:

$$Q_D = 2.7 \times 190 (H-5.2)^{3/2} = 510 (H-5.2)^{3/2}$$

4') ROAD DEPRESSION, SLOPING TERRAIN AT RIGHT:

$$L'_{R,RO} = \frac{2}{3}(30)(H-2.6) \quad \therefore (Q'_{R,RO}) = 54 (H-2.6)^{5/2} \quad H \leq 5.2'$$

$$(Q'_{R,RO})_2 = 2.7 \times 78 (H-3.2)^{3/2} = 210 (H-3.2)^{3/2} \quad \text{FOR } H > 5.2'$$

5') ROAD DEPRESSION - TERRAIN AT ELEV. (+) 296.3' MVD:

$$Q_{RO} = 2.7 \times 215 (H-2.6)^{3/2} = 580 (H-2.6)^{3/2}$$

6') ROAD DEPRESSION, SLOPING TERRAIN AT LEFT:

$$L'_{L,RO} = \frac{2}{3}(20)(H-2.6) \quad \therefore Q'_{L,RO} = 36 (H-2.6)^{5/2}$$

NOTE: IF THE ROAD DEPRESSION IS CLOSED BY AN EXTENSION OF THE DAM, EQUATIONS (4'), (5') AND (6') ARE REPLACED BY:

$$Q_{RO}^* = 2.7 \times 945 (H-5.2)^{3/2} + 36 (H-5.2)^{5/2} = 930 (H-5.2)^{3/2} + 36 (H-5.2)^{5/2}$$

Project NON-FEDERAL DAMS INSPECTION

Sheet D-7 of 10

Computed By HLL

Checked By SRM

Date 11/17/79

Field Book Ref. _____

Other Refs. CE #27-660-HIS

Revisions _____

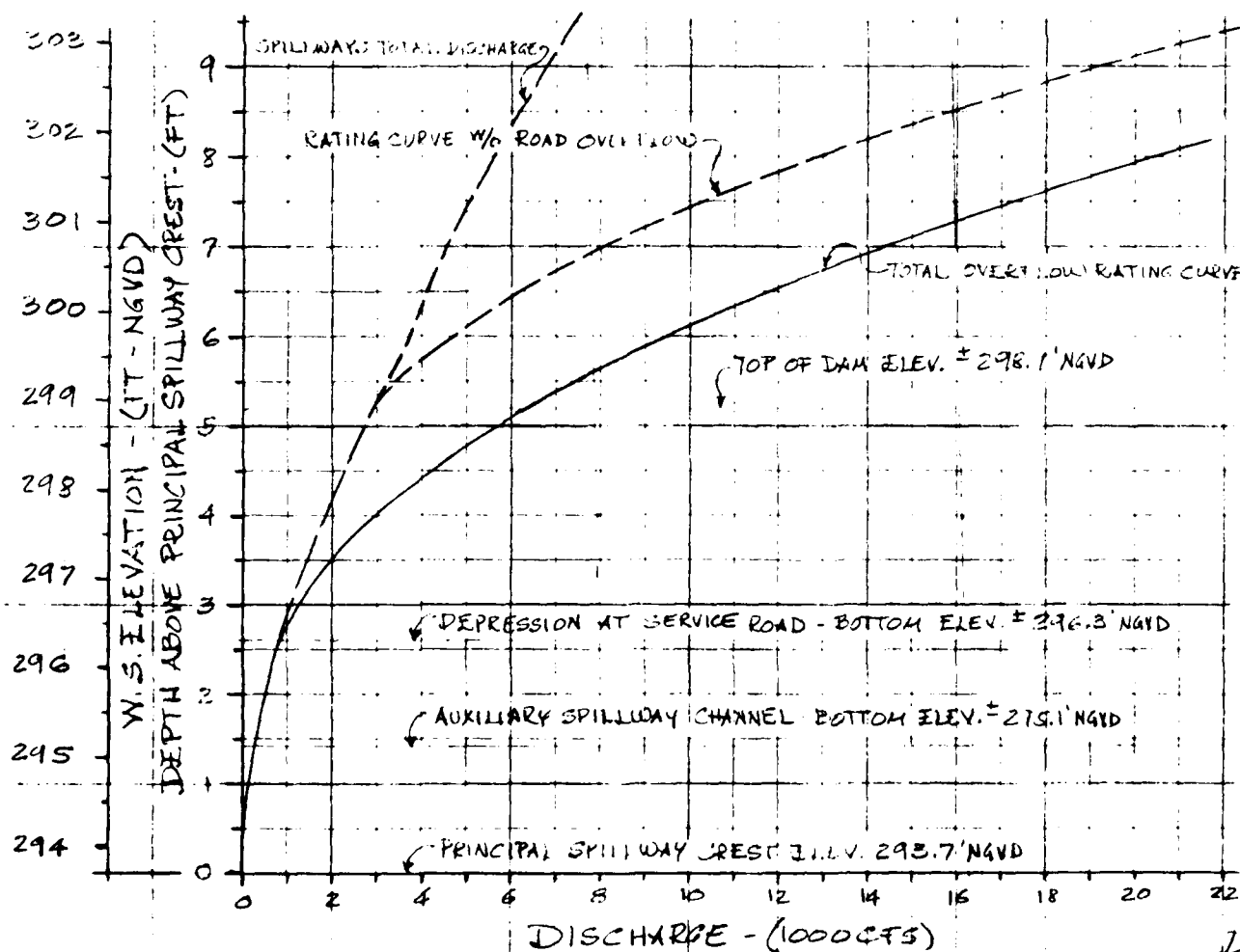
GRUPES RESERVOIR DAM

2, Q- (Cont'd) OVERFLOW RATING CURVE

THEREFORE, THE TOTAL OUTFLOW RATING CURVE IS APPROXIMATED BY:

$$Q \approx Q_s^* + 7.4(H-6.7)^{5/2} + 140(H-6.7)^{3/2} + 510(H-5.8)^{3/2} + 580(H-2.6)^{3/2} + 36(H-1.6)^{5/2} + (Q_{R,RD})^*$$

WHERE Q_s^* IS THE TWO SPILLWAYS OVERFLOW GIVEN BY THE EQUATIONS ON P. D-4 AND $(Q_{R,RD})^*$ IS THE ROAD OVERFLOW GIVEN BY THE EQUATIONS (4') ON P. D-6. THE RESULTING OUTFLOW RATING CURVE FOR GRUPES RESERVOIR DAM IS AS FOLLOWS:



Project NON FEDERAL DAMS INSPECTION

Sheet D-8 of 17

Computed By HLL

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Other Refs. CE #27-660-HB

Revisions _____

GRUPES RESERVOIR DAM

2-Cont'd) SURCHARGE AT PEAK INFLOWS

b) SURCHARGE HEIGHT TO PAK² PEAK INFLOWS (Q_p & C_p)

i) @ $Q_p = PMF \approx 16300^{cfs}$ $H_s \approx 7.4'$ ($H_s \approx 8.6'$ w/ ROAD OVERFLOW)

ii) @ $Q_p = \frac{1}{2} PMF \approx 8150^{cfs}$ $H_s \approx 5.7'$ ($H_s \approx 7.0'$ w/ ROAD OVERFLOW)

c) EFFECT OF SURCHARGE STORAGE ON PEAK OUTFLOWS:

i) AVERAGE LAKE AREA WITHIN EXPECTED SURCHARGE:

1) LAKE AREA AT FLOW LINE (ELEV. 293.7' NGVD): $A_{WL} \approx 23^{ac}$

2) AREA AT CONTOUR 300' NGVD*: $A_{300} \approx 26^{ac}$

3) AREA AT CONTOUR 310' NGVD*: $A_{310} \approx 39^{ac}$

AREA AT ELEV. 303' MSL (MAX. EXPECTED SURCH.): $A_{303} \approx 30^{ac}$

AVE. AREA WITHIN EXPECTED SURCHARGE: $A = 26.5^{ac}$ SAY, $\bar{A} = 27^{ac}$

*NOTE: AREAS FROM USGS NORWALK NORTH, CONN.-NY, QUADRANGLE SHEET AND C.N. WOOD "FLOWAGE MAP" OF GRUPES RESERVOIR, DATED 181-, AND CITY OF NORWALK, FIRST TAXING DISTRICT "MAP OF RESERVOIRS", DATED FEB. 1930

ii) ASSUME NORMAL POOL AT FLOW LINE ELEVATION: ELEV. 293.7' NGVD

iii) WATERSHED AREA: D.A. = 10.2^{sq}mi (SEE P. D-1)

iv) DISCHARGE (Q_p) AT VARIOUS HYPOTHETICAL SURCHARGE ELEVATIONS:

$H = 9'$ $V = 27 \times 9 = 243^{acft}$ $S = \frac{243}{10.2 \times 53.3} = 0.45''$

$H = 4'$ $V = 108^{acft}$ $S = 0.20''$

Project NON-FEDERAL DAMS INSPECTION

Sheet D 1 of

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Date 11/20/79

Field Book Ref. Other Refs CE #27-660-HB

Revisions

GRUPES RESERVOIR DAM

2. C. (Cont'd) EFFECT OF SURCHARGE STORAGE ON PEAK OUTFLOWS:

FROM APPROXIMATE ROUTING: NED-ACE GUIDELINES AND 17" MAX. PROBABLE R.O. IN NEW ENGLAND.

$$Q_P = Q_{P_1} \left(1 - \frac{S}{19}\right) \text{ AND FOR } \frac{1}{2} \text{ PMF: } Q'_P = Q'_{P_1} \left(1 - \frac{S}{9.5}\right)$$

∴ FOR THE PREVIOUS HYPOTHETICAL SURCHARGES:

$$H = 9' \quad Q_P = 15900 \text{ cfs} \quad Q'_P = 7760 \text{ cfs}$$

$$H = 4' \quad Q_P = 16100 \text{ cfs} \quad Q'_P = 8050 \text{ cfs}$$

$$\text{AND FOR } H = 0 \quad Q_P = 16300 \text{ cfs} \quad Q'_P = 8150 \text{ cfs}$$

d) PEAK OUTFLOWS (Q_P & Q'_P)

USING NED-ACE GUIDELINE: "SURCHARGE STORAGE: USING" ALTERNATE METHOD (SEE RATING CURVE P. D-7).

$$Q_P \approx 16000 \text{ cfs} \quad H_3 \approx 7.3' \text{ FOR } Q_P = \text{PMF} \left(Q'_{P_1} = 15900 \text{ cfs}, H_3 = 8.5' \right. \\ \left. \text{w/ ROAD OVERFLOW} \right)$$

$$Q'_P \approx 7900 \text{ cfs} \quad H'_3 \approx 5.6' \text{ FOR } Q'_P = \frac{1}{2} \text{ PMF} \left(Q'_{P_1} = 7850 \text{ cfs}, H'_3 = 6.7' \right. \\ \left. \text{w/ ROAD OVERFLOW} \right)$$

3) SPILLWAY CAPACITY RATIO TO PEAK INFLOWS AND OUTFLOWS:

a) SPILLWAY CAPACITY TO ELEVATION OF FIRST LOW POINT.

$$(\text{ROAD DEPRESSION} \approx \text{EL. 296.3' NGVD}) (H = 2.6'): (Q_S)_1 \approx 810 \text{ cfs}$$

∴ THE TOTAL SPILLWAY CAPACITY (2-SPWYS) TO FIRST OVERFLOW ELEVATION IS (±) 5.0 % OF THE INFLOW (Q_P) AND (±) 5.1 % OF THE OUTFLOW (Q'_P) AT PEAK FLOOD = PMF.

Project NON-FEDERAL DAM INSPECTION

Sheet 2-10 of 17

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Date 11/20/79

Field Book Ref.

Other Refs. CE # 37-660-HE

Revisions

GRUBBS RESERVOIR DAM

3.2. Cont'd.) SPILLWAY CAPACITY TO PEAK INFLOW & OUTFLOW

LIKewise, THE TOTAL SPILLWAY CAPACITY TO FIRST OVERFLOW CLEV. 3c (1)
7.9% OF THE INFLOW (Q_p) AND (1) 10% OF THE OUTFLOW (Q_o) AT PEAK
FLOOD = $\frac{1}{2}$ PMF

b) SPILLWAY CAPACITY TO TOP OF DAM (ASSUMING NO ROAD OVERFLOW):
 $H = 5.2'$ $(Q_{s,p}) = 2900$ CFS (TOTAL BOTH SPILLWAYS)

THE TOTAL SPILLWAY CAPACITY TO TOP OF DAM w/o ROAD OVERFLOW IS (1) 18%
OF THE INFLOW (Q_p) AND ALSO, OF THE OUTFLOW (Q_o) AT PEAK FLOOD = PMF.

LIKewise, THE TOTAL SPILLWAY CAPACITY FOR THESE CONDITIONS (3.6) IS (1) 36%
OF THE INFLOW (Q_p) AND (1) 37% OF THE OUTFLOW (Q_o) AT PEAK FLOOD = $\frac{1}{2}$ PMF

c) SPILLWAY CAPACITY TO TOP OF DAM (INCLUDING ROAD OVERFLOW):
 $H = 5.2'$ $(Q_{s,p}) = 2900 + 3400 = 6300$ CFS (SPILLWAYS + ROAD)

THE TOTAL SPILLWAY CAPACITY TO TOP OF DAM INCLUDING ROAD OVERFLOW IS (1) 39%
OF BOTH, THE INFLOW (Q_p) AND THE OUTFLOW (Q_o) AT PEAK FLOOD = PMF.

LIKewise, THE TOTAL SPILLWAY CAPACITY FOR THESE CONDITIONS (3.6) IS (1) 77%
OF THE INFLOW (Q_p) AND (1) 80% OF THE OUTFLOW (Q_o) AT PEAK FLOOD = $\frac{1}{2}$ PMF

d) SPILLWAY CAPACITY TO PMF AND $\frac{1}{2}$ PMF SURCHARGES:

e) CAPACITY TO PMF SURCHARGE (TOTAL BOTH SPILLWAYS ONLY)
 $H_2 = 7.3'$ $(Q_{s,p}) = 4900$ CFS

THE TOTAL SPILLWAY CAPACITY (w/o INCLUDING THE ROAD OVERFLOW) TO PMF
SURCHARGE IS (1) 30% OF THE INFLOW (Q_p) AND (1) 1% OF THE
OUTFLOW (Q_o) AT PEAK FLOOD = PMF

INCLUDING THE ROAD OVERFLOW AS SPILLWAY CAPACITY, $(Q_{s,p}) = 4900 + 9400 = 14300$
OR (1) 88% THE INFLOW (Q_p) AND (1) 89% THE OUTFLOW (Q_o) AT PEAK FLOOD = PMF

Project NEW FEDERAL DAMS INSPECTION

Sheet D-11 of 17

Computed By HLL

Checked By

Date 11/20/79

Field Book Ref

Other Refs CE #27-660-HB

Revisions

GRUPES RESERVOIR DAM

3.C.C - Cont'd) SPILLWAY CAPACITY TO PMF SURCHARGE

W/O THE ROAD OVERFLOW, $(H_3^*) = 8.5'$: $(Q_3^*)_3 = 6200$ CFS OR THE SPILLWAY CAPACITY TO PMF SURCHARGE IS $(\pm) 38\%$ OF (Q_p) AND $(\pm) 37\%$ OF (Q_3^*) AT PEAK FLOOD = PMF

(U) CAPACITY TO $\frac{1}{2}$ PMF SURCHARGE (TOTAL BOTH SPILLWAYS ONLY).

$H_{3.1} = 5.6'$ $(Q_3)_4 = 3300$ CFS

THE TOTAL SPILLWAY CAPACITY (W/O INCLUDING THE ROAD OVERFLOW) TO $\frac{1}{2}$ PMF SURCHARGE IS $(\pm) 40\%$ OF THE INFLOW (Q_p^*) AND $(\pm) 42\%$ OF THE OUTFLOW (Q_3^*) AT PEAK FLOOD = $\frac{1}{2}$ PMF INCLUDING THE ROAD OVERFLOW RE SPILLWAY CAPACITY, $(Q_{3.1})_4 = 3300 + 4400 = 7700$ CFS OR $(\pm) 94\%$ THE INFLOW (Q_p^*) AND $(\pm) 97\%$ THE OUTFLOW (Q_3^*) AT PEAK FLOOD = $\frac{1}{2}$ PMF

W/O THE ROAD OVERFLOW, $(H_3^*) = 6.9'$: $(Q_3^*)_4 = 4500$ CFS OR THE SPILLWAY CAPACITY TO $\frac{1}{2}$ PMF SURCHARGE IS $(\pm) 55\%$ OF (Q_p^*) AND $(\pm) 57\%$ OF (Q_3^*) AT PEAK FLOOD = $\frac{1}{2}$ PMF.

NOTE: GRUPES RESERVOIR DAM HAS A 24" ϕ - $(\pm) 135'$ LONG, VALVED OUTLET WITH ELEV. $(\pm) 273.3'$ NGVD. NEGLECTING THE SLUICE GATES LOSSES AT THE INTAKE TOWER AND OTHER PIPING MINOR LOSSES, THE OUTLET CAPACITY UNDER A HEAD OF $(\pm) 23'$ (FIRST OVERFLOW - ELEV. 296.3' NGVD) IS ESTIMATED AT $(\pm) 60$ CFS AND UNDER A HEAD OF $(\pm) 25'$ (TOP OF DAM ELEV. 298.9' NGVD) IS $(\pm) 65$ CFS.

Project NON-FEDERAL DAMS INSPECTION

Sheet D-12 of 17

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Date 11/21/79

Field Book Ref. _____

Other Refs. CE #27-660-HL

revisions _____

GRUPES RESERVOIR DAM

II) DOWNSTREAM FAILURE HAZARD

1) POTENTIAL IMPACT AREA

A LARGE NUMBER OF HOUSES LOCATED ALONG SILVERLINE RIVER DOWN TO THE CITY OF NORWALK AND, PARTICULARLY THOSE LOCATED (±) 1400' TO 12000' ϕ FROM THE DAM, NEAR VALLEY FORD AND HAVING FIRST FLOOR ELEVATIONS RANGING FROM (±) 5' TO 13' ABOVE THE STREAM, CONSTITUTE THE POTENTIAL IMPACT AREA IN CASE OF FAILURE OF THE GRUPES RESERVOIR DAM.

2) FAILURE AT GRUPES RESERVOIR DAM:

a) BREACH WIDTH:

i) HEIGHT OF DAM

TOP OF DAM (±) ELEV. 298.9' NGVD

ϕ S TOE OF DAM (STREAMBED) - (±) ELEV. *272.3' NGVD

$$\therefore H = 26.6' \text{ say, } H = 27'$$

ii) MID-HEIGHT OF DAM: (±) ELEV. 286' NGVD

$$(298.9 - \frac{26.6}{2} = 285.6' \text{ say } 216' \text{ NGVD})$$

iii) APPROX. MID-HEIGHT LENGTH: $L = 192'$ (*FROM C.E. FIELD MEASUREMENTS ON 10/16/79)

iv) BREACH WIDTH (SEE NED-ACE ϕ S DAM FAILURE GUIDELINES)

$$W = 0.4 \times 192 = 77' \quad \therefore \text{ASSUME } W_b = 77'$$

b) PEAK FAILURE OUTFLOW (Q_P)

ASSUME SURCHARGE TO TOP OF DAM (ELEV. 298.9' NGVD)

Project NON-FEDERAL DAMS INSPECTION

Sheet 2-3 of 7

Computed By HCU

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Date 11/21/79

Field Book Ref

Other Refs. CE #27-660-HB

Revisions

GRUPES RESERVOIR DAM

2,6-Cont'd) PEAK FAILURE OUTFLOW

C) HEIGHT AT TIME OF FAILURE: $Y_0 = 37'$

(1) SPILLWAY DISCHARGE AT TIME OF FAILURE:

1) SPILLWAYS: $Q_s = 2400$ cfs

2) ROAD DEPRESSION: $Q_{RD} = 3400$ cfs

3) TOTAL DISCH. TO SILVERMINE R.: $Q_0 = 6300$ cfs

(2) BREACH OUTFLOW (Q_b)

$$Q_b = \frac{3}{2} W_b V_2 Y_0^{3/2} = 18200 \text{ cfs}$$

(3) PEAK FAILURE OUTFLOW (Q_p) TO SILVERMINE RIVER:

$$Q_p = Q_0 + Q_b = 24500 \text{ cfs}$$

C) FLOOD DEPTH IMMEDIATELY $\frac{1}{2}$ FROM DAM:

$$Y = 0.4 \times Y_0 = 12'$$

D) ESTIMATE OF $\frac{1}{2}$ FAILURE CONDITIONS AT POTENTIAL IMPACT AREA:

(SEE NED-ACE GUIDELINES FOR ESTIMATING $\frac{1}{2}$ FAILURE HYDROGRAPHS)

(1) REACH OF SILVERMINE RIVER BETWEEN THE DAM AND THE IMPACT AREA:

THE $\pm 1400'$ LONG REACH OF SILVERMINE RIVER FROM THE GRUPES RESERVOIR DAM TO THE INITIAL IMPACT AREA AT VALLEY ROAD, IS APPROXIMATELY V-SHAPED WITH $\pm 30'$ TO $1'$ AND

Project NON-FEDERAL DAMS INSPECTION

Sheet D-14 of 17

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Date 11/21/79

Field Book Ref. _____

Other Refs. CE #27-660-HB

Revisions _____

GRUPES RESERVOIR DAM

2.d-Cont'd) FAILURE CONDITIONS AT IMPACT AREA

(±) 18" TO 1" SIDE SLOPES TO A DEPTH OF (±) 40'. THE AVERAGE SLOPE OF THE REACH IS (±) 0.5%.

(ii) GRUPES RESERVOIR STORAGE AT TIME OF FAILURE:

CAPACITY OF RESERVOIR TO FLOW LINE: $S_{WL} = 55.7 \text{ MG} = 171 \text{ ACFT}$

(DATA FROM CITY OF NORWALK - FIRST TAXING DISTRICT

"MAP OF RESERVOIRS" SCALE 1"=300', DATED FEB. 1930)

∴ STORAGE AT TIME OF FAILURE: $S_{MAX} = 171 + 5.2 \times 27 = 311 \text{ ACFT}$

($\frac{1}{2} = 155 \text{ ACFT}$)

*A = 27 AC - SEE P. D-8

NOTE: THE ACE-US INVENTORY OF DAMS, DATED JAN. 24, 1979, P. 7 GIVES

$S_{MAX} = 435 \text{ ACFT}$ AND $S_{NORM} = 396 \text{ ACFT}$.

(iii) PEAK INFLOW TO REACH: $Q_p = 24500 \text{ CFS}$ (SEE P. D-13)

(iv) APPROXIMATE STAGE AT POTENTIAL IMPACT AREA AFTER FAILURE OF GRUPES RESERVOIR DAM:

$Q_p = 24500 \text{ CFS}$; $y_1 = 12.1'$; $V_1 = 113 \text{ ACFT} \leq \frac{1}{2} A$ (ON REACH OF 1400'; $\eta = 90\%$)

$Q_2 = Q_p (1 - \frac{V}{A}) = 15600 \text{ CFS}$; $y_2 = 10.2'$; $V_2 = 80.4 \text{ ACFT}$; $V_2 = 76.7 \text{ ACFT}$; $Q_3 = 16900 \text{ CFS}$

∴ REACH OUTFLOW: $Q_3 = 16900 \text{ CFS}$ STAGE: $y_3 = 10.5'$

(SIMILARLY, $\frac{1}{2}$ ROAD OVERFLOW: $Q_1^* = 21100 \text{ CFS}$; $Q_2^* = 15100 \text{ CFS}$; $y_3^* = 10.1'$)

(v) APPROXIMATE STAGE BEFORE FAILURE:

SILVERMINE RIVER FLOW BEFORE FAILURE: $Q_0 = 6300 \text{ CFS}$ $y = 7.3'$

(NOTE: $\frac{1}{2}$ ROAD OVERFLOW: $Q_3 = 2900 \text{ CFS}$ $y_3 = 5.4'$)

f) RAISE IN STAGE AT IMPACT AREA: $\Delta y = 3.2'$ ($\Delta y = 4.7'$ $\frac{1}{2}$ ROAD OVERFLOW)

Project NON-FEDERAL DAMS INSPECTION

Sheet D-15 of 17

Computed By SKL

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Date 11/21/79

Field Book Ref. _____

Other Refs. CE #27-660-HE

Revisions _____

GRUPES RESERVOIR DAM

III) SELECTION OF TEST FLOOD

1) CLASSIFICATION OF DAM ACCORDING TO NED-ACE GUIDELINES.

a) SIZE: *STORAGE (MAX) = 311 ACFT ($50 < S < 1000$ ACFT)
 *HEIGHT = 27' ($25 < H < 40$ FT)

*NOTE: STORAGE (SEE P. D-14); HEIGHT (SEE P. D-12)

SIZE CLASSIFICATION: SMALL

b) HAZARD POTENTIAL: AS A RESULT OF THE P. FAILURE ANALYSIS AND IN VIEW OF THE IMPACT THAT FAILURE OF GRUPES RESERVOIR DAM MAY HAVE ON THE POTENTIAL IMPACT AREA DESCRIBED ON P. D-12, THIS DAM IS CLASSIFIED AS HAVING:

HAZARD CLASSIFICATION: HIGH

2) TEST FLOOD: PMF = 16300 CFS

THIS SELECTION IS MADE BASED ON THE RESULTS OF THE PREVIOUS ANALYSIS AND CLASSIFICATION.

Project NON-FEDERAL DAMS INSPECTION

Sheet D-16 of 17

Computed By HLL

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Date 11/21/79

Field Book Ref.

Other Refs. CE #27-660-HB

Revisions

GRUPES RESERVOIR DAM

IV) SUMMARY AND COMMENTS

1) TEST FLOOD = PMF = 16300 CFS

(PARALLEL COMPUTATIONS HAVE BEEN MADE FOR $\frac{1}{2}$ PMF = 8150 CFS AND ARE ALSO SUMMARIZED BELOW)

2) PERFORMANCE AT PEAK FLOOD CONDITIONS:

a) PEAK INFLOWS: $Q_P = PMF = 16300$ CFS

$Q_P' = \frac{1}{2} PMF = 8150$ CFS

b) PEAK OUTFLOWS: $Q_P = 16000$ CFS

$Q_P' = 7900$ CFS

c) SPILLWAY CAPACITY:

(i) TO FIRST LOW POINT (ROAD DEPRESSION); ($H = 2.6'$): (Q_S)₁ = 810 CFS
OR, (±) 5.1% OF (Q_P) AND (±) 10% OF (Q_P')

(ii) TO TOP OF DAM (ASSUMING NO ROAD OVERFLOW); ($H = 5.2'$): (Q_S)₂ = 2900 CFS
OR, (±) 18% OF (Q_P) AND (±) 37% OF (Q_P')

(INCLUDING ROAD OVERFLOW): ($H = 5.2'$): (Q_{SR})₂ = 6300 CFS OR,
(±) 39% OF (Q_P) AND (±) 80% OF (Q_P')

(iii) TO PMF SURCHARGE ($H_s = 7.3'$): (Q_S)₃ = 4900 CFS OR, (±) 31% OF (Q_P)
(INCL. ROAD OVERFLOW): ($H_s = 7.3'$): (Q_{SR})₃ = 14300 CFS OR, (±) 89% OF (Q_P)
(% ROAD OVERFLOW): ($H_s^* = 8.5'$): (Q_{SR}^*)₃ = 6200 CFS OR, (±) 39% OF (Q_P^*)

(iv) TO $\frac{1}{2}$ PMF SURCHARGE ($H_s^* = 5.6'$): (Q_S)₄ = 3300 CFS OR, (±) 42% OF (Q_P')
(INCL. ROAD OVERFLOW): ($H_s^* = 5.6'$): (Q_{SR}^*)₄ = 7700 CFS OR, (±) 97% OF (Q_P')
(% ROAD OVERFLOW): ($H_s^* = 6.9'$): (Q_{SR}^*)₄ = 4500 CFS OR, (±) 57% OF ($Q_P'^*$)

THEREFORE, AT TEST FLOOD $Q_P = PMF$, THE DAM IS OVERTOPPED TO A DEPTH OF (±) 2.1' (WS (H) ELEV. 301.0' AND) OR, TO A SURCHARGE OF (±) 7.3' ABOVE THE PRINCIPAL SPILLWAY CREST ELEV. 293.7' AND, % THE ROAD OVERFLOW, THE SURCHARGE WILL BE (±) 8.5' AND THE CORRESPONDING OVERTOPPING OF THE DAM WILL BE (±) 3.3' (WS ± ELEV. 302.2' AND)

SIMILARLY, AT $Q_P' = \frac{1}{2} PMF$, THE DAM IS OVERTOPPED (±) 0.4' (WS (H) EL. 299.2' AND)

Project NON-FEDERAL DAMS INSPECTION

Sheet D-17 of 17

Computed By HLL

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Field Book Ref. _____

Other Refs CE#27-660-HB

Revisions _____

GRIMES RESERVOIR DAM

2.C-Cont'd) SUMMARY AND CONCLUSIONS

OR, TO A SURCHARGE OF (±) 5.6' ABOVE THE PRINCIPAL SPILLWAY CREST. W/O THE ROAD OVERFLOW, THE SURCHARGE WILL BE (±) 6.9' AND THE CORRESPONDING OVERTOPPING OF THE DAM WILL BE (±) 1.7' (W.S. ELEV. 300.6' NGVD)

3) DOWNSTREAM FAILURE CONDITIONS:

a) PEAK FAILURE OUTFLOW: $Q_p \approx 24500 \text{ CFS}$ (W/O ROAD OVERFLOW $Q_p \approx 21100 \text{ CFS}$)

b) FLOOD DEPTH IMMEDIATELY D/S FROM DAM: $Y_o \approx 12'$

c) CONDITIONS AT THE INITIAL IMPACT AREA 1/3 FROM DAM (SILVERMINE RIVER)

i) APPROXIMATE STAGE BEFORE FAILURE: $Y_o \approx 7.3'$ ($Q_o \approx 6300 \text{ CFS}$)
W/O ROAD OVERFLOW $Y_o \approx 5.4'$ ($Q_o \approx 2900 \text{ CFS}$)

ii) APPROXIMATE STAGE AFTER FAILURE: $Y_3 \approx 10.5'$ ($Q_3 \approx 16900 \text{ CFS}$)
W/O ROAD OVERFLOW $Y_3 \approx 10.1'$ ($Q_3 \approx 15100 \text{ CFS}$)

iii) APPROXIMATE RAISE IN STAGE AFTER FAILURE: $\Delta Y \approx 3.2'$
W/O ROAD OVERFLOW: $\Delta Y \approx 4.7'$

PRELIMINARY GUIDANCE
FOR ESTIMATING
MAXIMUM PROBABLE DISCHARGES
IN
PHASE I DAM SAFETY
INVESTIGATIONS

New England Division
Corps of Engineers

March 1978

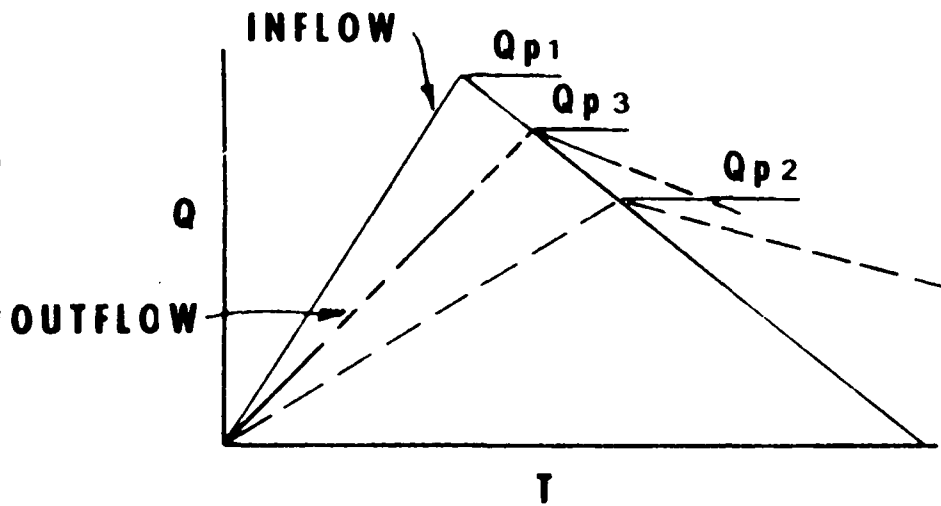
MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

<u>Project</u>	<u>Q</u> (cfs)	<u>D.A.</u> (sq. mi.)	<u>MPF</u> cfs/sq. mi.
1. Hall Meadow Brook	26,600	17.2	1,546
2. East Branch	15,500	9.25	1,675
3. Thomaston	158,000	97.2	1,625
4. Northfield Brook	9,000	5.7	1,580
5. Black Rock	35,000	20.4	1,715
6. Hancock Brook	20,700	12.0	1,725
7. Hop Brook	26,400	16.4	1,610
8. Tully	47,000	50.0	940
9. Barre Falls	61,000	55.0	1,109
10. Conant Brook	11,900	7.8	1,525
11. Knightville	160,000	162.0	987
12. Littleville	98,000	52.3	1,870
13. Colebrook River	165,000	118.0	1,400
14. Mad River	30,000	18.2	1,650
15. Sucker Brook	6,500	3.43	1,895
16. Union Village	110,000	126.0	873
17. North Hartland	199,000	220.0	904
18. North Springfield	157,000	158.0	994
19. Ball Mountain	190,000	172.0	1,105
20. Townshend	228,000	106.0(278 total)	820
21. Surry Mountain	63,000	100.0	630
22. Otter Brook	45,000	47.0	957
23. Birch Hill	88,500	175.0	505
24. East Brimfield	73,900	67.5	1,095
25. Westville	38,400	99.5(32 net)	1,200
26. West Thompson	85,000	173.5(74 net)	1,150
27. Hodges Village	35,600	31.1	1,145
28. Buffumville	36,500	26.5	1,377
29. Mansfield Hollow	125,000	159.0	786
30. West Hill	26,000	28.0	928
31. Franklin Falls	210,000	1000.0	210
32. Blackwater	66,500	128.0	520
33. Hopkinton	135,000	426.0	316
34. Everett	68,000	64.0	1,062
35. MacDowell	36,300	44.0	825

MAXIMUM PROBABLE FLOWS
BASED ON TWICE THE
STANDARD PROJECT FLOOD
(Flat and Coastal Areas)

<u>River</u>	<u>SPF</u> (cfs)	<u>D.A.</u> (sq. mi.)	<u>MPF</u> (cfs/sq. mi.)
1. Pawtuxet River	19,000	200	190
2. Mill River (R.I.)	8,500	34	500
3. Peters River (R.I.)	3,200	13	490
4. Kettle Brook	8,000	30	530
5. Sudbury River.	11,700	86	270
6. Indian Brook (Hopk.)	1,000	5.9	340
7. Charles River.	6,000	184	65
8. Blackstone River.	43,000	416	200
9. Quinebaug River	55,000	331	330

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Q_{p1}) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass " Q_{p1} ".

b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

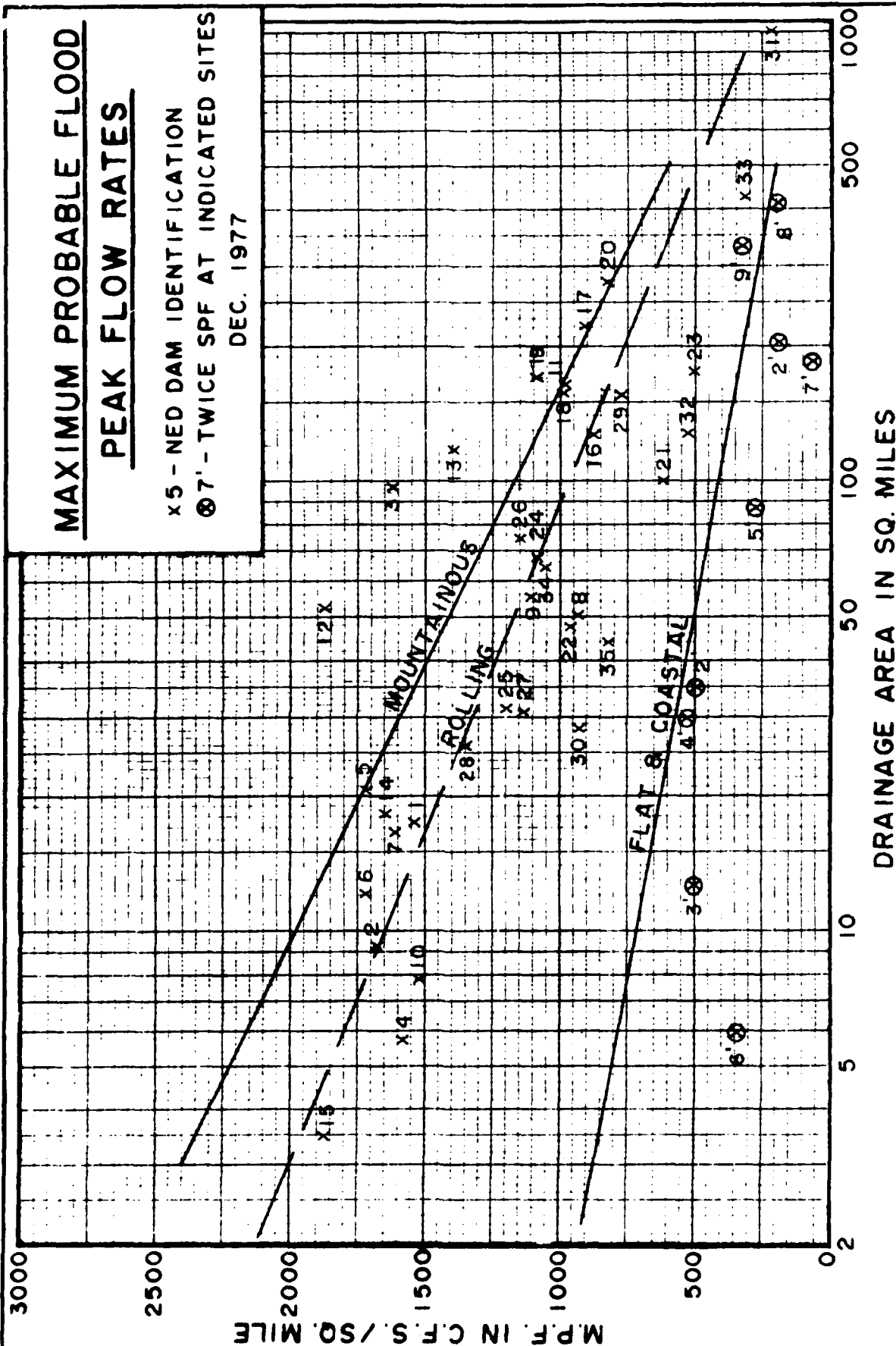
$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and " $STOR_2$ " To Pass " Q_{p2} "

b. Average " $STOR_1$ " and " $STOR_2$ " and Determine Average Surcharge and Resulting Peak Outflow " Q_{p3} ".

MAXIMUM PROBABLE FLOOD PEAK FLOW RATES

x 5 - NED DAM IDENTIFICATION
 ⊗ 7' - TWICE SPF AT INDICATED SITES
 DEC. 1977



SURCHARGE STORAGE ROUTING SUPPLEMENT

**STEP 3: a. Determine Surcharge Height and
"STOR₂" To Pass "Q_{p2}"**

**b. Avg "STOR₁" and "STOR₂" and
Compute "Q_{p3}".**

**c. If Surcharge Height for Q_{p3} and
"STOR_{avg}" agree O.K. If Not:**

**STEP 4: a. Determine Surcharge Height and
"STOR₃" To Pass "Q_{p3}"**

**b. Avg. "Old STOR_{avg}" and "STOR₃"
and Compute "Q_{p4}"**

**c. Surcharge Height for Q_{p4} and
"New STOR_{avg}" should Agree
closely**

SURCHARGE STORAGE ROUTING ALTERNATE

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{\text{STOR}}{19} \right)$$

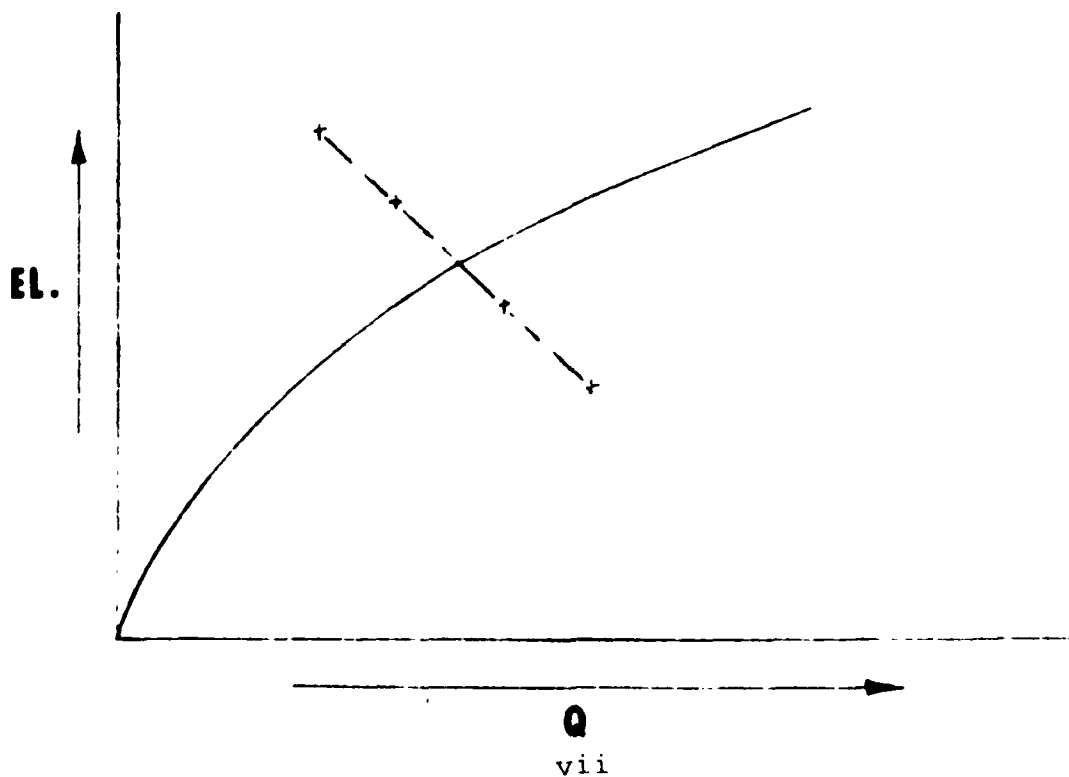
$$Q_{p2} = Q_{p1} - Q_{p1} \left(\frac{\text{STOR}}{19} \right)$$

FOR KNOWN Q_{p1} AND 19" R.O.

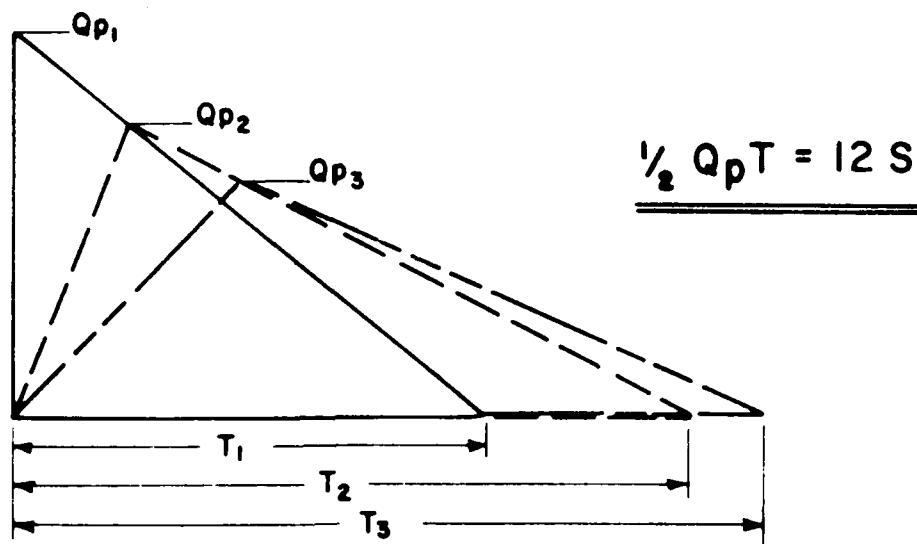
Q_{p2}
=====

STOR
=====

EL.
=====



"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Q_{p1} = \frac{8}{27} W_b \sqrt{g} Y_0^{3/2}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40' OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_0 = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

- A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOMPANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)
- B. DETERMINE TRIAL Q_{p2} .
- C. COMPUTE V_2 USING Q_{p2} (TRIAL).
- D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2} .

$$Q_{p2} = Q_{p1} \left(1 - \frac{V_{avg}}{S} \right)$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

APPENDIX E

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS



INVENTORY OF DAMS IN THE UNITED STATES

STATE	DIVISION	STATE	COUNTY	COUNTY	CONTRACT	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE
CT	57	CT	001	05		GRUPES RESERVOIR DAM	4111.3	7329.3	01DEC79

POPULAR NAME	NAME OF IMPONDMENT
	GRUPES RESERVOIR

REGION	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01 10	SILVERMINE RIVER	PINE HILL	1	1200

TYPE OF DAM	YEAR COMPLETED	PURPOSES	HYDRAULIC CAPACITIES		IMPOUNDING CAPACITIES
			STAGNANT HEIGHT (FT.)	MAXIMUM FLOOD (ACRE-FT.)	
GRPG	1871	8	27	27	311

DIST OWN FED R PRV/FED SC8 A VER/DATE
NED N N N N

REMARKS

D/S	SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY (KW)	NAVIGATION LOCKS
1	225 U 49	2900			

OWNER	ENGINEERING BY	CONSTRUCTION BY
FIRST DISTRICT WATER DEP		

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
CT WATER RESOURCES	CT WATER RESOURCES	CT WATER RESOURCES	CT WATER RESOURCES

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
CANN ENGINEERS INC	05NOV79	PL 92-367

REMARKS

END

FILMED

8